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# Review of the genus *Agonochaetia* Povolný (Lepidoptera, Gelechiidae), and description of a new genus and species from the Canary Islands

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## Abstract

The Holarctic genus *Agonochaetia* is reviewed and a new species, *Agonochaetia shawinigan* Landry, **sp. nov.** is described from Québec, Canada. In addition, a new glandiductor-bearing genus and species, *Canarischema fuerteventura* Karsholt, **gen. nov., sp. nov.** is described from the Canary Islands. Comparative diagnoses, a key to species, illustrations of external aspect, male and female genitalia are provided for all species. Most species of *Agonochaetia* are rarely collected and known only from their types or from very few specimens. DNA barcodes are provided for four of the species from which DNA was recovered. Analysis of DNA barcodes suggests that *Agonochaetia* may be paraphyletic. Phylogenetic relationships to other Gnorimoschemini genera bearing a pair of glandiductors above the phallus are discussed.

**Key words:** Gelechiinae, Gnorimoschemini, Palearctic Region, Nearctic Region, systematics, taxonomy, glandiductor, new genus, new species

## Introduction

With a wide Holarctic distribution from Europe to Japan and North America, the genus *Agonochaetia* Povolný, 1965 comprises rather large, broad-winged Gelechiidae with essentially unicolorous brown wings, in some species with a few indistinct black spots on the forewings.

Currently eight species are recognized under *Agonochaetia*. The genus and its type species, *A. incredibilis* Povolný, 1965, were described based on a single male specimen from Uzbekistan and placed in the Gnorimoschemini. In the same publication, Povolný also described another gnorimoschemine genus, *Sautereopsis* Povolný, 1965 to accommodate the European taxon *Gelechia terrestrella* Zeller, 1872. However, *Sautereopsis* was later synonymized with *Agonochaetia* by Sattler (1968), who also described *A. intermedia* Sattler, 1968 from southwestern Russia. Hodges (1983) transferred the North American *Gelechia conspersa* Braun, 1921 to *Agonochaetia*, and thus established the presence of the genus in the Nearctic region. Povolný (1990) described *A. quartana* Povolný, 1990 based on a single female from Bulgaria. More recently, two new species have been described from Central Asia: *A. tuvella* Bidzilya, 2000 and *A. lvovskyi* Bidzilya, 2001, each based on single male specimen. Lastly, *Brachmia impunctella* Caradja, 1920 was recognized to belong to *Agonochaetia* by Ponomarenko (2008b), a species described from the Russian Far East based on a unique female.

All Palearctic species have been found in xeric steppe habitats up to elevations of about 2000 m. One of the Nearctic species (*A. conspersa*) has been found at a few scattered localities in the Rocky Mountains without

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records of the habitat, whereas a new species herein described was collected in southern Québec. The moths have been collected from May to July, thus essentially in the first half of summer. Nothing is known about their life history, but there has been speculation that their larvae possibly feed on Caryophyllaceae (Huemer & Karsholt 2010).

All *Agonochaetia* species are rarely collected and, with the exception of *A. intermedia* (see Junnilainen *et al.* 2010) are known from a single to a handful of specimens. The paucity of material makes the assessment of character state differences and the delineation of species problematic and somewhat subjective, especially when widely allopatric samples are concerned, or when only one sex is available. DNA barcodes are now used widely in species delineation to help interpret or supplement ambiguous morphological data and to associate sexes (e.g. Huemer & Hebert 2011; Huemer & Mutanen 2012; Landry *et al.* 2013; Nazari 2017). We successfully obtained DNA barcodes for four of the recognized species but the few barcoded specimens were males only. We found no useful external features that allow some species to be recognized with certainty. Even recognition of a member of the genus requires examination of the genitalia (as applies to many genera of Gelechiidae), the external aspect being at best suggestive of the possibility of belonging to *Agonochaetia*, while some members of other gelechiid genera (e.g. *Chionodes* and *Filatima* in the Gelechiini, to mention just two) look confusingly similar. Despite the paucity of specimens and data, we felt that the description of a new species from an unexpected region, even if based on a single specimen, was worthwhile considering how scattered the few existing records are in time and space. Framing the description within a synopsis of the genus could stimulate further exploration and discovery of additional material.

In this work, we describe a previously unknown species of *Agonochaetia* from Québec, Canada and provide a synopsis of the genus. The existence of the new species has been known to JFL for several years but its description awaited a suitable context and collaboration, as well as the possibility of adding DNA barcodes to the morphological description. Furthermore we describe a new genus and species from the Canary Islands which shares several morphological traits with *Agonochaetia* yet differs significantly enough to warrant placement in a separate genus. Lastly we present an analysis of DNA barcodes of glandiductor-bearing gnorimoschemine genera and discuss briefly possible phylogenetic implications.

## Materials and methods

The present study is based on specimens from the following collections (Table 1):

| | |
|---|---|
| ANIC | Australian National Insect Collection, Canberra, Australia |
| ANSP | Academy of Natural Sciences Philadelphia, Pennsylvania, USA |
| AW | Collection of Andreas Werno, Nunkirchen, Germany |
| BMNH | Natural History Museum, London, U.K. |
| BNMC | Bündner Naturmuseum, Chur, Switzerland |
| CNC | Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada |
| EMEC | Essig Museum of Entomology, Berkeley, California, USA |
| ETHZ | Eidgenössische Technische Hochschule, Zürich, Switzerland |
| LACM | Natural History Museum of Los Angeles County, Los Angeles, California, USA |
| LP | Collection of Lubomir Panigaj, Košice, Slovakia |
| MGAB | Grigore Antipa Museum of Natural History, Bucarest, Romania |
| MZH | Finnish Museum of Natural History, Helsinki, Finland |
| NUPP | Collection of Kari & Timo Nupponen, Espoo, Finland |
| SMNK | Staatliches Museum für Naturkunde, Karlsruhe, Germany |
| TLMF | Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria |
| USNM | National Museum of Natural History, Smithsonian Institution, Washington D.C., USA |
| WS | Collection of Willibald Schmitz, Gladbach, Germany |
| ZIN | Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia |
| ZMHU | Museum für Naturkunde, Berlin, Germany |
| ZMKU | Zoological Museum, Kiev National Taras Shevchenko University, Kiev, Ukraine |

| | |
|---|---|
| ZMUC | Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark |
| ZSM | Zoologische Staatssammlung, München, Germany |

**Genitalia and wing preparation.** Male and female genitalia were dissected and prepared using standard methods (*e.g.* Landry 2007). Male genitalia were spread using the unrolling technique as described by Pitkin (1986) and Huemer (1988), except for the holotype of *A. incredibilis* for which the already fixed intact genitalia was photographed from the original slide mount. For venation, wings were removed, soaked in 95% ethanol, transferred with a brush in diluted sodium hypochlorite solution (laundry bleach: 1 drop per 3 ml of 30% ethanol) for about one minute or until discolored, rinsed in 30% ethanol, and stained in a saturated solution of orange G in 30% ethanol) for 24 hours. Following staining, wings were rinsed in 70% ethanol where loose scales and matted fringe were carefully brushed off, then dehydrated in 100% propanol, dipped in Euparal essence, and slide-mounted in Euparal.

**Specimen photography.** Different equipments were used by the authors. Details for photos of pinned specimens and dissections by VN and JFL are provided in Landry *et al.* (2013). Photos by OB: Pinned specimens were photographed with a Canon G11 and light box, and the genitalia were photographed with a digital camera DCM130E attached to a MBR-1 microscope.

**Sequence analysis.** DNA extracts were prepared from one or two legs removed from each specimen. DNA extraction, PCR amplification of the barcode region of COI, and subsequent sequencing followed standard protocols at the Canadian Centre for DNA Barcoding (deWaard *et al.* 2008). Beside two specimens of *Canarischema fuerteventura*, four *Agonochaetia* species (*A. intermedia, A. shawinigan, A. terrestrella, A. tuvella*) yielded full-length barcode sequences, while attempts to barcode two others (*A. conspersa, A. lvovskyi*) failed. No specimens were available for barcoding of the remaining three species. All resultant sequences, along with the voucher data, images, and trace files, are publicly available in the BOLD dataset http://dx.doi. org/10.5883/DS-AGONOCHA. Three new sequences (KY818714–6) were deposited in GenBank (Table 1). Uncorrected p-distances were calculated in MEGA6 (Tamura *et al.* 2013). Available sequences for *Agonochaetia* and *Canarischema* were included in a dataset together with representatives from four other glandiductor-bearing genera of Gnorimoschemini, namely *Nevadopalpa, Insuloschema, Pogochaetia* and *Tila*, as well as non-glandiductor bearing *Lutilabria* (due to its close affinity with *Agonochaetia*). *Gnorimoschema gallaesolidaginis* and *Phthorimaea operculella* were selected as outgroups. The dataset was subjected to Maximum Parsimony and Maximum Likelihood analyses in MEGA6 (Tamura *et al.* 2013) under the Kimura 2-parameter model of base substitution and with 1000 bootstrap replications, and a Bayesian analysis of 50m generations in MrBayes v.3.2 (Ronquist *et al.* 2012) under the $GTR + \Gamma + I$ model with two simulations, independent Markov chain Montecarlo (MCMC) runs starting from different random trees, each with three heated chains and one cold chain.

**Abbreviations for genitalia structures and measurements.** Several genitalia structures varied in size relative to adjacent structures among species. Such differences can be assessed visually with ease but are more difficult to express in words in a manner that makes their assessment and comparison across species clear, especially when they are minor. Measurements were made from the photographs on the plates and used to calculate ratios as a way to describe proportions. The ratios must be treated as descriptive and approximate, and are not intended to reflect absolute size differences. Terms for genitalia and abbreviations are shown in Figs 23–24. Wing length was measured from base to apex including the fringe, and wing width, in the middle of the wing. Scale bars are not provided for some figures because they were not recorded at the time that the photos were taken and the specimens were not available anymore.

**Descriptions.** More detailed descriptions are given for the new species as well as for *A. conspersa* for which the genitalia were never described previously. The other species have been previously described and illustrated in other works (notably Povolný 2002a; Huemer & Karsholt 2010), thus their re-descriptions are brief and worded to conform to the format presented here inasmuch as allowed by the limited material available. Attempts to describe some characters from differently mounted or damaged preparations, or from photographs alone may have resulted in a certain lack of precision and comparability. Although we strived to standardize the descriptions as much as possible, the paucity of material limited what could be achieved.

**TABLE 1.** Specimens examined and Genbank accessions.

| | Identification | Kind of specimen | Specimen ID | BOLD Process ID | Barcode BIN | Barcode Length | Accession | Sex |
|---|---|---|---|---|---|---|---|---|
| 1 | *Agonochaetia conspersa* | ordinary | CNCLEP00090715 | CNCLA1553-13 | — | 0 | — | M |
| 2 | *Agonochaetia conspersa* | ordinary | CNCLEP00083080 | CNCLA1555-13 | — | 0 | — | M |
| 3 | *Agonochaetia conspersa* | ordinary | CNCLEP00002752 | CNCLA1556-13 | — | 0 | — | M |
| 4 | *Agonochaetia conspersa* | ordinary | CNCLEP00100884 | CNCLA1710-13 | — | 0 | — | M |
| 5 | *Agonochaetia conspersa* | Holotype | — | — | — | — | — | M |
| 6 | *Agonochaetia conspersa* | ordinary | USNMENT01328039 | — | — | — | — | M |
| 7 | *Agonochaetia conspersa* | ordinary | USNMENT01349736 | — | — | — | — | M |
| 8 | *Agonochaetia conspersa* | ordinary | USNMENT01200833 | — | — | — | — | M |
| 9 | *Agonochaetia conspersa* | ordinary | USNMENT01200834 | — | — | — | — | M |
| 10 | *Agonochaetia impunctella* | Holotype (Photos examined) | — | — | — | — | — | F |
| 11 | *Agonochaetia incredibilis* | Holotype | — | — | — | — | — | M |
| 12 | *Agonochaetia intermedia* | ordinary | TLMF Lep 04555 | PHLAE430-11 | | 307[0n] | KY818718 | M |
| 13 | *Agonochaetia intermedia* | ordinary | TLMF Lep 04556 | PHLAE431-11 | BOLD:ABV4430 | 658[0n] | KX042073 | F |
| 14 | *Agonochaetia intermedia* | ordinary | TLMF Lep 10408 | LEATB231-13 | BOLD:ABV4430 | 658[0n] | KY442160 | M |
| 15 | *Agonochaetia intermedia* | Holotype | — | — | — | — | — | M |
| 16 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 17 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 18 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 19 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 20 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 21 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 22 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 23 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 24 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 25 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 26 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | M |
| 27 | *Agonochaetia intermedia* | ordinary | — | — | — | — | — | F |
| 28 | *Agonochaetia lvovskyi* | ordinary | BIDZ-00040 | MPEB136-12 | — | 0 | — | M |
| 29 | *Agonochaetia lvovskyi* | Holotype | — | — | — | — | — | M |
| 30 | *Agonochaetia quartana* | Holotype | — | — | — | — | — | F |
| 31 | *Agonochaetia shawinigan* | Holotype | CNCLEP00002751 | MNAJ153-09 | BOLD:AAH8547 | 658[0n] | HM424719 | M |

*……continued on the next page*

**TABLE 1.** (Continued)

| | Identification | Dissection | Collectors | Collection Date | Country | State/Province |
|---|---|---|---|---|---|---|
| 1 | *Agonochaetia conspersa* | MIC3121, J.-F. Landry | J.McDunnough | 26.VI.1923 | Canada | Alberta |
| 2 | *Agonochaetia conspersa* | MIC6094, J.-F. Landry | C.B.D.Garrett | 19.VII.1922 | Canada | Alberta |
| 3 | *Agonochaetia conspersa* | JFL1575, J.-F. Landry | — | 8.VII.1910 | United States | Colorado |
| 4 | *Agonochaetia conspersa* | USNM142500, J.-F. Landry | O.Bryant | 22.VI.1924 | Canada | Alberta |
| 5 | *Agonochaetia conspersa* | VNZ78, V. Nazari | Annette F. Braun | 24.VII.1920 | United States | Montana |
| 6 | *Agonochaetia conspersa* | USNM6757, R.W. Hodges | — | 8.VII.1915 | United States | California |
| 7 | *Agonochaetia conspersa* | USNM142571, V. Nazari | R.W. Hodges | 4–6.VII.1965 | United States | South Dakota |
| 8 | *Agonochaetia conspersa* | — | R.W. Hodges | 7.VII.1965 | United States | South Dakota |
| 9 | *Agonochaetia conspersa* | — | R.W. Hodges | 28.VI.1965 | United States | South Dakota |
| 10 | *Agonochaetia impunctella* | 176452/4220, K.T. Park 1996 | — | no date | Russia | Khabarovsk Krai |
| 11 | *Agonochaetia incredibilis* | St. 321 | Hbr. [Haberhauer] | 1885 | Uzbekistan | |
| 12 | *Agonochaetia intermedia* | — | Burmann K. | 3.VI.1983 | Austria | Tirol |
| 13 | *Agonochaetia intermedia* | GU 87/107, P. Huemer | Huemer P. | 10.VI.1987 | Austria | Tirol |
| 14 | *Agonochaetia intermedia* | — | Huemer P. | 7.VI.2013 | Austria | Tirol |
| 15 | *Agonochaetia intermedia* | BMNH3887 | H. Christoph | 10.VII.1864 | Russia | |
| 16 | *Agonochaetia intermedia* | — | K. Nupponen | 4.VI.2011 | Kazakhstan | Mugozhary mts. |
| 17 | *Agonochaetia intermedia* | — | K. Nupponen | 4.VI.2011 | Kazakhstan | Mugozhary mts. |
| 18 | *Agonochaetia intermedia* | — | K. Nupponen | 4.VI.2011 | Kazakhstan | Mugozhary mts. |
| 19 | *Agonochaetia intermedia* | — | J. Junnilainen | 13–15.VI.1998 | Russia | Orenburg district |
| 20 | *Agonochaetia intermedia* | — | K.& T. Nupponen | 5.VII.2000 | Russia | Altai Mountains |
| 21 | *Agonochaetia intermedia* | 183/16, O. Bidzilya | K. Nupponen | 25.VI.2002 | Russia | S-Buryatia |
| 22 | *Agonochaetia intermedia* | gen. prep. in glycerol | Jalava & Kullberg | 10.VII.1996 | Russia | Buryatia |
| 23 | *Agonochaetia intermedia* | gen. prep. in glycerol | Jalava & Kullberg | 10.VII.1996 | Russia | Buryatia |
| 24 | *Agonochaetia intermedia* | 184/16, O. Bidzilya | Bidzilya, I.& O. Kostjuk | 6.VII.1997 | Russia | Transbaikalia |
| 25 | *Agonochaetia intermedia* | JFL1754, J.-F. Landry | K. Burmann | 17.V.1975 | Austria | Tirol |
| 26 | *Agonochaetia intermedia* | — | K. Burmann | 1.VI.1978 | Austria | Tirol |
| 27 | *Agonochaetia intermedia* | GP ETH 1160, W. Sauter | — | 19.VII.1934 | Switzerland | |
| 28 | *Agonochaetia lvovskyi* | 163/15, O. Bidzilya (in glycerol) | V. Artemieva | 28.VI.1989 | Russia | Altayskiy Kray |
| 29 | *Agonochaetia lvovskyi* | — | A.L. Lvovsky | 22.VI.1998 | Russia | Altai |
| 30 | *Agonochaetia quartana* | Mn. 3222 [?] | Rebel | VI.1896 | Bulgaria | |
| 31 | *Agonochaetia shawinigan* | MIC4240, J.-F. Landry | L.-P. Landry | 24.VI.1996 | Canada | Quebec |
| 32 | *Agonochaetia terrestrella* | 04/1216, P. Huemer | S. & Z. Kovacs | 17.V.1994 | Romania | Dobrogea |

……continued on the next page

**TABLE 1.** (Continued)

| | Identification | Locality | Latitude | Longitude | Elevation (m) | Depository |
|---|---|---|---|---|---|---|
| 1 | *Agonochaetia conspersa* | Waterton Lakes | 49.082403 | -113.918724 | | CNC |
| 2 | *Agonochaetia conspersa* | Banff | 51.178363 | -115.570769 | 2195 | CNC |
| 3 | *Agonochaetia conspersa* | San Juan County, Silverton | 37.810414 | -107.67831 | | CNC |
| 4 | *Agonochaetia conspersa* | Bilby | 53.711006 | -114.107765 | | USNM |
| 5 | *Agonochaetia conspersa* | Glacier National Park | 48.759879 | -113.792217 | | ANSP |
| 6 | *Agonochaetia conspersa* | Tulare County, Mineral King | 36.450058 | -118.593048 | | USNM |
| 7 | *Agonochaetia conspersa* | Lawrence County, Stovehole Park, T2N R1E S2,3 | 44.162084 | -103.975897 | | USNM |
| 8 | *Agonochaetia conspersa* | Lawrence County, Spearfish Creek, T3N R1E S6 | 44.2495733 | -104.0453137 | | USNM |
| 9 | *Agonochaetia conspersa* | Lawrence County, Spearfish Creek, T3N R1E S6 | 44.2495733 | -104.0453137 | | USNM |
| 10 | *Agonochaetia impunctella* | Kasakew.[itch] | 48.502731 | 135.06626 | | MGAB |
| 11 | *Agonochaetia incredibilis* | Margellan | 40.480125 | 71.726659 | | ZMHU |
| 12 | *Agonochaetia intermedia* | Nordtirol, Fliess | 47.122 | 10.648 | 1000 | TLMF |
| 13 | *Agonochaetia intermedia* | Nordtirol, Fliess | 47.122 | 10.648 | 1000 | TLMF |
| 14 | *Agonochaetia intermedia* | Nordtirol, Zams, Steinseehuettenweg | 47.176 | 10.604 | 880 | TLMF |
| 15 | *Agonochaetia intermedia* | Sarepta | 48.520241 | 44.51213 | | BMNH |
| 16 | *Agonochaetia intermedia* | Berchogur vill. 3 km NW | 48.4875 | 58.520556 | 450 | NUPP |
| 17 | *Agonochaetia intermedia* | Berchogur vill. 3 km NW | 48.4875 | 58.520556 | 450 | NUPP |
| 18 | *Agonochaetia intermedia* | Berchogur vill. 3 km NW | 48.4875 | 58.520556 | 450 | NUPP |
| 19 | *Agonochaetia intermedia* | 12 km S Kuvandyk, mountain hilly steppe | 51.350633 | 57.36924 | | ZMUC |
| 20 | *Agonochaetia intermedia* | Chuja valley, Aktash village 5 km SE | 50.250765 | 87.659542 | 1500 | NUPP |
| 21 | *Agonochaetia intermedia* | Chikoy valley, Novoselenginsk vill. 10 km S, sand dunes/sandy steppe | 50.975595 | 106.651129 | 550-600 | NUPP |
| 22 | *Agonochaetia intermedia* | Barguzin valley, Djirga st., Betula/mead. | 54.916667 | 111.233333 | 600 | FMNH |
| 23 | *Agonochaetia intermedia* | Barguzin valley, Djirga st., Betula/mead. | 54.916667 | 111.233333 | 600 | FMNH |
| 24 | *Agonochaetia intermedia* | Chita reg., Kyra | 48.525112 | 44.499114 | 900 | ZMKU |
| 25 | *Agonochaetia intermedia* | Nordtirol, Fliess | 47.1215 | 10.6484 | 1000 | TLMF |
| 26 | *Agonochaetia intermedia* | Nordtirol, Fliess | 47.1215 | 10.6484 | 1000 | ZMUC |
| 27 | *Agonochaetia intermedia* | Zermatt | 46.039081 | 7.777637 | | ETHZ |
| 28 | *Agonochaetia lvovskyi* | Ongudai district, Inja river | 50.745 | 86.1403 | 852 | ZMKU |
| 29 | *Agonochaetia lvovskyi* | Shebalino | 51.290778 | 85.667752 | | ZIN |
| 30 | *Agonochaetia quartana* | Slivno | 42.681654 | 26.322868 | | ZSM |
| 31 | *Agonochaetia shawinigan* | St. Maurice, Notre-Dame-du-Mont-Carmel | 46.471178 | -72.551178 | | CNC |
| 32 | *Agonochaetia terrestrella* | Baneasa, Rez. Canaraua Petii/Fetii | 44.063 | 27.7015 | | TLMF |

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**TABLE 1.** (Continued)

| | Identification | Kind of specimen | Specimen ID | BOLD Process ID | Barcode BIN | Barcode Length | Accession | Sex |
|---|---|---|---|---|---|---|---|---|
| 32 | *Agonochaetia terrestrella* | ordinary | TLMF Lep 04557 | PHLAE432-11 | BOLD :ABV4431 | 656[2n] | KX042107 | F |
| 33 | *Agonochaetia terrestrella* | Lectotype | — | — | — | — | — | M |
| 34 | *Agonochaetia tuvella* | ordinary | BIDZ-00039 | MPEB135-12 | BOLD :ACT4243 | 629[0n] | KY818714 | M |
| 35 | *Agonochaetia tuvella* | Holotype | — | — | — | — | — | M |
| 36 | *Canarischema fuerteventura* | Holotype | ZMUC00029762 | MNAQ1047-16 | BOLD :ACZ6649 | 573[0n] | KY818716 | M |
| 37 | *Canarischema fuerteventura* | Paratype | ZMUC00029763 | MNAQ1048-16 | BOLD :ACZ6649 | 622[0n] | KY818715 | M |
| 38 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 39 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 40 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 41 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 42 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 43 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 44 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | F |
| 45 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 46 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 47 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 48 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 49 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | F |
| 50 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 51 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | F |
| 52 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 53 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | M |
| 54 | *Canarischema fuerteventura* | Paratype | — | — | — | — | — | F |
| 55 | *Phthorimaea operculella* | ordinary | CNCLEP00077354 | MNAO179-11 | BOLD :AAB9396 | 658[0n] | KY442082 | |
| 56 | *Lutilabria lutilabrella* | ordinary | TLMF Lep 06847 | PHLAG453-12 | BOLD :ABW4984 | 658[0n] | KY442065 | |
| 57 | *Tila capsophilella* | ordinary | TLMF Lep 13508 | LEATF196-14 | BOLD :ACL7124 | 658[0n] | KY442086 | |
| 58 | *Tuta chiquitelloides* | Paratype | CNCLEP00100775 | CNCLA1512-13 | BOLD :ACG8207 | 658[0n] | KY818719 | F |
| 59 | *Gnorimoschema gallaesolidaginis* | ordinary | CNCLEP00082384 | MNAN390-11 | BOLD :AAT9819 | 658[0n] | JN270978 | |
| 60 | *Nevadopalpa maculata* | ordinary | CNCLEP00067412 | MNAJ154-09 | BOLD :AAG5275 | 658[0n] | GU693660 | F |
| 61 | *Insuloschema barbarae* | ordinary | EMEC331031 | MNAP170-12 | BOLD :ABV9404 | 658[0n] | KY442142 | M |
| 62 | *Pogochaetia solitaria* | ordinary | TLMF Lep 13705 | LEATF393-14 | BOLD :ACA9790 | 658[0n] | KY442200 | |
| 63 | *Tecia solanivora* | ordinary | NC_029386 | GBMTG5914-16 | BOLD :ACP2393 | 1531[0n] | KY818717 | |

*……continued on the next page*

**TABLE 1.** (Continued)

| | Identification | Dissection | Collectors | Collection Date | Country | State/Province |
|---|---|---|---|---|---|---|
| 33 | *Agonochaetia terrestrella* | | Zeller | 1871–1872 | Switzerland | |
| 34 | *Agonochaetia tuvella* | 66/03, O. Bidzilya | P. Ustjuzhanin | 14.VI.2001 | Russia | Tuva Republik |
| 35 | *Agonochaetia tuvella* | 117/15, O. Bidzilya | Yu. Kostjuk | 16.VI.1969 | Russia | Tuva Republik |
| 36 | *Canarischema fuerteventura* | 6319, H. Hendriksen | R. Paas | 15.XII.2006 –14.I.2007 | Spain | Canary Islands |
| 37 | *Canarischema fuerteventura* | MIC 7845, J.-F. Landry (wing and genitalia) | R. Paas | 20.II.2006 –15.III.2011 | Spain | Canary Islands |
| 38 | *Canarischema fuerteventura* | — | R. Paas | 15.XII.2006 –14.I.2007 | Spain | Canary Islands |
| 39 | *Canarischema fuerteventura* | — | R. Paas | 15.XII.2006 –14.I.2007 | Spain | Canary Islands |
| 40 | *Canarischema fuerteventura* | — | R. Paas | 15.XII.2006 –14.I.2007 | Spain | Canary Islands |
| 41 | *Canarischema fuerteventura* | — | R. Paas | 3–16.X.2000 | Spain | Canary Islands |
| 42 | *Canarischema fuerteventura* | 137/15, O. Bidzilya | R. Paas | 25.IX.–19.X.2002 | Spain | Canary Islands |
| 43 | *Canarischema fuerteventura* | — | R. Paas | 25.IX.–19.X.2002 | Spain | Canary Islands |
| 44 | *Canarischema fuerteventura* | 138/15, O. Bidzilya | R. Paas | 18–24.XII.2003 | Spain | Canary Islands |
| 45 | *Canarischema fuerteventura* | — | R. Paas | 18–24.XII.2003 | Spain | Canary Islands |
| 46 | *Canarischema fuerteventura* | — | R. Paas | 18–24.XII.2003 | Spain | Canary Islands |
| 47 | *Canarischema fuerteventura* | — | R. Paas | 18–24.XII.2003 | Spain | Canary Islands |
| 48 | *Canarischema fuerteventura* | — | R. Paas | 30.IX.–6.X.2004 | Spain | Canary Islands |
| 49 | *Canarischema fuerteventura* | — | R. Paas | 30.IX.–6.X.2004 | Spain | Canary Islands |
| 50 | *Canarischema fuerteventura* | — | R. Paas | 8–24.X.2004 | Spain | Canary Islands |
| 51 | *Canarischema fuerteventura* | — | R. Paas | 8–24.X.2004 | Spain | Canary Islands |
| 52 | *Canarischema fuerteventura* | — | R. Paas | 15–31.X.2005 | Spain | Canary Islands |
| 53 | *Canarischema fuerteventura* | — | R. Paas | 15–31.X.2005 | Spain | Canary Islands |
| 54 | *Canarischema fuerteventura* | — | R. Paas | 25.X.–8.XI.2008 | Spain | Canary Islands |
| 55 | *Phthorimaea operculella* | — | B. & J.-F. Landry | 13.VII.1989 | United States | Kansas |
| 56 | *Lutilabria lutilabrella* | — | Habeler H. | 30.V.2001 | Slovenia | |
| 57 | *Tila capsophilella* | — | Huemer P. | 05.VIII.2013 | Austria | Tirol |
| 58 | *Tuta chiquitelloides* | JAP7451, J. Powell | — | 01.V.1995 | United States | California |
| 59 | *Gnorimoschema gallaesolidaginis* | — | B.C. Schmidt | 01.IX.2008 | Canada | Ontario |
| 60 | *Nevadopalpa maculata* | MIC 6073, J.-F. Landry | J.F. Landry | 03.VII.1985 | Canada | Alberta |
| 61 | *Insuloschema barbarae* | JAP8362, J. Powell | JA Powell | 26.V.2001 | United States | California |
| 62 | *Pogochaetia solitaria* | — | Huemer P. | 07.IX.2013 | Italy | South Tyrol |
| 63 | *Tecia solanivora* | — | Ramirez-Rios et al. | 2011–2012 | Colombia | Nariño department |

*……continued on the next page*

**TABLE 1.** (Continued)

| | Identification | Locality | Latitude | Longitude | Elevation (m) | Depository |
|---|---|---|---|---|---|---|
| 33 | *Agonochaetia terrestrella* | Bergün | 46.683419 | 9.634504 | | BMNH |
| 34 | *Agonochaetia tuvella* | 16 km N Kyzyl | 51.8902 | 94.3989 | 1000 | ZMKU |
| 35 | *Agonochaetia tuvella* | Ujuk distr., Seserlig | 51.876915 | 94.255196 | | ZMKU |
| 36 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | ZMUC |
| 37 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | CNC |
| 38 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 39 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 40 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 41 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | TLMF |
| 42 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | ZMKU |
| 43 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | ZMUC |
| 44 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | ZMUC |
| 45 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | ZMUC |
| 46 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 47 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 48 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 49 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 50 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 51 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 52 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 53 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | WS |
| 54 | *Canarischema fuerteventura* | Fuerteventura, Bco. [Barranco de] Esquinzo | 28.077 | -14.306 | | AW |
| 55 | *Phthorimaea operculella* | Trego County, Cedar Bluff State Park | 38.774 | -99.774 | | CNC |
| 56 | *Lutilabria lutilabrella* | Kozina Umgebung | 45.619 | 13.928 | 450 | TLMF |
| 57 | *Tila capsophilella* | Steinseehuettenweg | 47.176 | 10.604 | 880 | TLMF |
| 58 | *Tuta chiquitelloides* | Santa Barbara County, Ranch Headquarters, Santa Rosa Id., Beechers Bay | 34.004 | -120.051 | | CNC |
| 59 | *Gnorimoschema gallaesolidaginis* | Lanark County, Pakenham, alvar | 45.33 | -76.243 | 115 | CNC |
| 60 | *Nevadopalpa maculata* | Sandy Point Campground | 50.733 | -110.05 | | CNC |
| 61 | *Insuloschema barbarae* | Ventura County, Santa Barbara Island, S. end above Cat Cyn. | 33.467 | -119.036 | 65 | EMEC |
| 62 | *Pogochaetia solitaria* | Schleiser Leiten | 46.698 | 10.517 | 1320 | TLMF |
| 63 | *Tecia solanivora* | — | 1.051776 | -76.776697 | | mined from GenBank |

## Taxonomy

### Genus *Agonochaetia* Povolný, 1965

*Agonochaetia* Povolný, 1965: 487. Type species: *Agonochaetia incredibilis* Povolný, 1965: 487, fig.10, by original designation. Huemer & Karsholt 2010: 294.

= *Sautereopsis* Povolný, 1965: 488. Type species: *Gelechia terrestrella* Zeller, 1872: 111, by original designation. Synonymized by Sattler, 1968: 119.

**Diagnosis.** *Agonochaetia* is characterized by the following unique combination of characters in the male genitalia: 1) a pair of needle-like glandiductors that are as long or longer than the phallus, outwardly and upwardly curved, slightly sinuate, with their anterior bulbous base closed (blind sac), and free from each other and from the phallus; 2) mesio-distal process of the gnathos absent; 3) sacculus large and heavy, inwardly bent at 90 degrees, comma-shaped. In the female genitalia (known for only four of the nine species) the antrum is elongate, anteriorly tapered, funnel-like, as long or longer than sternum 8, and the signum is an elongate, triangular base plate with a straight spine. Externally *Agonochaetia* moths are rather large, broad-winged, mostly unicolorous brown Gnorimoschemini which may be confused with *Lutilabria* species, and also with some *Filatima, Chionodes*, or other large and indistinctly marked or unmarked brown gelechiids with broad wings.

**Description. Adult (Figs. 1–12).** Rather large (wingspan 13–21 mm), broad-winged Gnorimoschemini with mostly unicolorous brown or beige brown forewings, in some species with 2 or 3 black spots in discal and postmedian area and along termen. Labial palpus slender, segment 3 shorter than 2. Antenna with flagellum filiform. Forewing and hindwing broad, ratio width/length = 0.26–0.30 in FW, 0.30–0.36 in HW. Hindwing sinuation weakly suggested or indistinct.

**Wing venation (Fig. 15).** Forewing with R1–R5 running to costa; R4 and R5 stalked, with M1 extended from their common stalk; pterostigma absent; in some specimens an accessory cell present between R1 and R2 (observed in *A. intermedia*); upper portion of cell open; CuP absent. Hindwing with R1 running into Sc beyond base of wing; M1 extended from Rs beyond cell closure; upper portion of cell open, lower portion with closure perpendicular with long axis of wing; M3 and CuA1 stalked (the long stalk in Fig. 15 is probably atypical; in another *A. intermedia* specimen in which the veins were examined without a cleared preparation, the M3-CuA1 stalk was short on the right side but long on the left; in the specimen illustrated, the stalk was short on both hindwings).

**Abdomen (Figs. 19, 21).** Lateral ridges of tergum I (so-called marginosclerites; see Kristensen 2003: 94) unmelanized throughout. Tergum VIII tongue-shaped, anterior margin thickened. Sternum VIII transversely sub-rectangular or sub-trapezoid, anterior margin thickened, posterior margin slighty indented; in male, without coremata.

**Male genitalia (Figs. 25–26, 29–35).** Tegumen triangularly elongate with deep and roundly arched anterior notch (TGN/TGL = 0.40–0.67; ratio may vary depending on amount of flattening). Uncus trapezoid, 0.3–0.4x length of tegumen, anterior margin fused to distal margin of tegumen and with delineation from latter somewhat indistinct as a dorso-lateral sulcus/impression, apical margin transversely straight, lined with several short setae, with shallow medial indentation. Gnathos with proximal arms short, stubby, apices club-like or hatchet-like and not mesially joined; mesial process vestigial, reduced to small, thin, bracelet-like sclerotized band embedded in apical part of culcitula and free from proximal arms. Culcitula a large, elongate, pouch-like lobe extended from apex of uncus to slightly below apex of proximal arms of gnathos. Vinculum transverse, with a deep V-shaped medio-posterior emargination, ventral wall between cucullus base and vincular lobes finely wrinkled; vincular lobes hump-like, finger-like, pointed or squarish, mesio-dorsal surface densely and finely setose; saccus very long and thin, broadened basally, 0.85– 1.6x length of valva. Cucullus extended beyond apex of uncus, narrow, inner (ventral) margin variously widened or lobate in distal third, distal ¼ slender, digitiform or pointed. Sacculus strongly downcurved at almost 90° (appearing incurved in flattened preparation), apex rounded or widened with shallow concavity and acuminate tip. Paired glandiductor lobes needle-like, outwardly and upwardly curved, slightly sinuate, as long or longer than phallus, anterior portion variously dilated; lobes free from each other and from phallus, situated on each side and slightly dorsad of phallus at end of deep inpocketing of diaphragma. Phallus straight, slightly longer than saccus, apex with triangular dorsal tooth, caecum markedly bulbous, inception of ductus ejaculatorius dorso-anterior on caecum.

**Female genitalia (Figs. 37–41).** Segment VIII longer than broad, without distinct sclerotized modifications, only short longitudinal folds ventrally. Anterior apophyses longer than segment VIII (AA/S8L = 1.5–3.5), base gradually widened and merged with wall of segment VIII. Antrum elongate, funnel-shaped, with posterior margin variously concave or indented. Ductus bursae membranous throughout, without ornamentation, sclerotization or spicules; corpus bursae ovoid to oblong; signum with sub-triangular basal plate and straight, thin, hook.

**Biology.** Host plants and immature stages unknown. Huemer & Karsholt (2010) speculated that larval hosts possibly include Caryophyllaceae based on its putative relationship to other Gnorimoschemine genera with Caryophyllaceae as host plants [‘caryocoloid’ Gnorimoschemini (Povolný & Šustek 1988)]. Povolný (1990) speculated that some species of *Agonochaetia* might be oligophagous (as in *Sattleria dzieduszyckii* Nowicki, 1864) without explaining the grounds for such speculation. All Palearctic species inhabit xeric steppe-slopes, in Europe at elevations up to 2000 m. Even less is known about the Nearctic species: no host or habitat information is known for the western *A. conspersa* which was found at a few scattered localities in the West, whereas the new species described below was found, unexpectedly, in a suburban backyard in Eastern Canada.

**Distribution.** Holarctic, with seven described species recorded from the Swiss Alps (Graubünden: Münstertal, Bergun, Ramosch; Wallis: Zermatt), Austrian Alps (Fliess, Kauns), Balkan (Bulgaria, Romania) Uzbekistan (Margellan), southern part of European Russia (southern Ural Mts. and Volgograd), southern Siberia (Altai and Tuva Mts., Buryatia, Zabaikalskiy krai), the Russian Far East (Khabarovsk krai), western Kazakhstan, Japan (Hokkaido), and two from North America (one in the East, one in the West).

**Remarks.** The species of *Agonochaetia* seem to be generally rather rare, xeromontane taxa with a scattered (islet-like) distributional pattern. The scantiness of material is a major hindrance for the validation of taxa in this genus (Huemer & Karsholt 2010) as well as for assessing species distributions.

The fact that a junior synonym of the European *A. terrestrella* (i.e., *muestairella*) was long regarded as a synonym of *Chionodes praeclarella* (Herrich-Schäffer, 1854) based on its superficial aspect until its genitalia were eventually examined (Sauter 1961; Sattler 1961) is telling of how difficult these gelechiid taxa are to recognize from external characters alone. Despite the broad (wide) wings that are characteristic of *Agonochaetia*, no particular venational features which differed from other Gnorimoschemini were observed. Povolný (2002b) indicated that the venation of members of the tribe did not differ significantly from the common (unspecified groundplan?) pattern exhibited in the Gelechiinae or even in the Gelechiidae, but there is little evidence in most of his works that he examined venation.

**About the synonymy of *Sautereopsis* with *Agonochaetia*.** In the descriptions of *Agonochaetia* and *Sautereopsis*, Povolný (1965) did not specify the distinguishing features of both genera. Sattler (1968) synonymized them, arguing that study of their type species did not support their separate generic status and that the discovery of a species with intermediate features, *A. intermedia* Sattler, 1968, further supported the generic synonymy. Sattler considered that the difference in the projection of the cucullus (termed ‘dorsal arm of the valva’), which is triangularly produced in *A. terrestrella* (the type species of *Sautereopsis*), simple in *A. incredibilis* (type species of *Agonochaetia*), and intermediate in *A. intermedia*, is not a feature worthy of generic status. Even though Sattler’s decision implied subjective weighting of character states (differences in shape of a lobe versus absence of lobe), he pointed out other characters uniting the three species then known: gnathos without a hook (= without mesio-distal process); divided valva (=cucullus and sacculus) with the ventral arm (= sacculus) strongly bent; long saccus; paired thin filaments (= glandiductors) arising near the base of aedeagus (= phallus); aedeagus slender with a slightly swollen base. A cucullus with a variously developed ventral lobe is observed in other genera, for example in several *Caryocolum* and in some *Lutilabria*, whereas the cucullus is simple in many Gnorimoschemini (Huemer & Karsholt 2010). Thus it appears that, in order to be meaningful, any character analysis will have to involve a broad array of gnorimoschemine taxa. While we recognize the subjective weighting involved in the current assessment of these characters, we still prefer to retain the generic synonymy pending better and broader character analysis.

## Checklist of *Agonochaetia*

The species are listed alphabetically given the lack of phylogenetic analysis to subtend a better classification and the fact that the morphological information available is not readily comparable for all the species.

*Agonochaetia* Povolný, 1965
= *Sauteropsis* Povolný, 1965

1. *A. conspersa* (Braun, 1921) (*Gelechia*)
2. *A. impunctella* (Caradja, 1920) (*Brachmia*)
3. *A. incredibilis* Povolný, 1965
4. *A. intermedia* Sattler, 1968
5. *A. lvovskyi* Bidzilya, 2001
6. *A. quartana* Povolný, 1990
7. *A. shawinigan* Landry, **sp. nov.**
8. *A. terrestrella* (Zeller, 1872) (*Gelechia*)
   = *Gelechia muestairella* Müller-Rutz, 1922
9. *A. tuvella* Bidzilya, 2000

**Key to male genitalia of *Agonochaetia***
The males of *A. impunctella* and *A. quartana* are not known.

| | | |
|---|---|---|
| 1. | Apex of sacculus rounded | 2 |
| - | Apex of sacculus acute | 3 |
| 2. | Sacculus bend near apex; phallus about 20x longer than wide | 9. *A. tuvella* |
| - | Sacculus bend near base; phallus 8x longer than wide | 3. *A. incredibilis* |
| 3. | Saccus longer than valva complex (SAL/VLL > 1.3) | 4 |
| - | Saccus shorter than valva complex (SAL/VLL < 1) | 5 |
| 4. | Vincular emargination U-shaped, vincular processes squared, mesially narrow, with obliquely squared tip | 1. *A. conspersa* |
| - | Vincular emargination V-shaped, vincular processes humped, mesially wide, with rounded tip | 7. *A. shawinigan* |
| 5. | Vincular processes obliquely squared and barely extended beyond posterior margin of vinculum | 5. *A. lvovskyi* |
| - | Vincular processes pointed and extended markedly beyond posterior margin of vinculum | 6 |
| 6. | Ventro-distal edge of cucullus broadly rounded and gradually tapered to apex | 4. *A. intermedia* |
| - | Ventro-distal edge of cucullus markedly produced into sub-triangular projection, forming acute angle with cucullus tip | 8. *A. terrestrella* |

**Key to female genitalia**
The females of *A. conspersa, A. incredibilis, A. lvovskyi, A. shawinigan* and *A. tuvella* are not known.

| | | |
|---|---|---|
| 1. | Signum base isosceles | 6. *A. quartana* |
| - | Signum base equilateral | 2 |
| 2. | Antrum about the same length as posterior apophyses | 8. *A. terrestrella* |
| - | Antrum about half the length of posterior apophyses | 3 |
| 3. | Apex of antrum extended to distal third of anterior apophyses | 4. *A. intermedia* |
| - | Apex of antrum extended to middle of anterior apophyses | 2. *A. impunctella* |

**Review of *Agonochaetia* species**

**1. *Agonochaetia conspersa* (Braun, 1921)**
(Figs 1, 19, 21, 25–26, 29)

*Gelechia conspersa* Braun 1921: 9. Type locality: McDermott Lake, Glacier National Park, Montana, USA. McDunnough 1939: 71 [checklist].
*Agonochaetia conspersa* (Braun, 1921); Hodges 1983: 22 [checklist as new combination]; Lee *et al.* 2009: 27 [checklist].

**Material examined.** Holotype ♂ "Glacier Nat. Pk. | VII.24.20 Mont. | Annette F. Braun" [white, printed, date hand-written]; "Gelechia | conspersa | Type Braun" [white hand-written]; "AFB" [white, hand-written]; "TYPE | Collection of | Annette F. Braun." [red, printed]; "genitalia slide | VNZ 78 ♂" [green printed] (ANSP) (examined by VN).

1 ♂ USA: **Colorado:** San Juan County, Silverton, 18 Jul 1910, specimen # CNCLEP00002752, slide JFL1575 (USNM). Canada: **Alberta:** 1 ♂ Bilby, 22 Jun 1924, O. Bryant, specimen # CNCLEP00100884, slide USNM142500 (USNM). 1 ♂ Banff, 19 Jul 1922, 7200 ft., specimen # CNCLEP00083080, dissection MIC6094, C.B.D. Garrett (CNC); 1 ♂ Waterton Lakes, 26 Jun 1923, specimen # CNCLEP00090715, slide MIC3121, J. McDunnough (CNC). USA: **California**, 1 ♂ Tulare Co., Mineral King, 8 Jul 1915, specimen # USNMENT01328039, slide USNM6457 (USNM). **South Dakota**: 1 ♂ Lawrence Co., Stovehole Park, 4–6 Jul 1965, R.W. Hodges, specimen # USNMENT01349736, slide USNM142571; 2 ♂, Lawrence Co., Spearfish Creek, 28 Jun and 7 Jul 1965, R.W. Hodges, specimens # USNMENT01200833–01200834 (USNM).

**DNA Barcode BIN.** Barcoding failed.

**Adult (Fig. 1).** Wingspan 18–19 mm. Labial palpus pale greyish brown mixed with greyish white, third segment with minute black spot at base outwardly. Antenna brown annulated with dirty white. Head and thorax pale greyish brown. Forewing pale beige brown in holotype and one other male with one indistinct darker discal spot and another at end of cell; forewing darker uniformly grey brown in two other males; bases of scales whitish grey, dusted with scattered dirty white scales; row of faint dark spots extended around apex from apical third of costa to tornus; cilia greyish white at their bases, brown at their tips with indistinct brown line through middle. Hindwing pale brownish grey in holotype, cilia greyish white. Upper side of abdomen grey, apical tuft greyish white. Underside of body and legs, except hind tibia and tarsus, dark brown, sparsely dusted with white. Hind tibia and tarsus greyish white inwardly, dusted with brown outwardly except at tips of segments. Male abdomen (Fig. 21) with tergum VIII elongate-linguiform with weakly thickened anterior margin, sternum VIII transverse with shallow medio-posterior notch.

**Male genitalia (Figs. 25, 26, 29).** Tegumen elongate with roundly arched anterior notch (TGN/TGL = 0.55). Uncus trapezoid, 0.4x length of tegumen, anterior margin fused to distal margin of tegumen and with delineation from latter somewhat indistinct as a dorso-lateral sulcus/impression, apical margin transversely straight, lined with several short setae, without indentation. Gnathos with proximal arms short, stubby, apices club-like and not mesially joined; mesio-distal arm free from proximal arms, reduced to small, thin, bracelet-like sclerotized band embedded in apical part of culcitula. Culcitula a large, elongate, pouch-like lobe extended from apex of uncus to slightly below apex of proximal arms of gnathos.Vinculum transverse, with deep U-shaped medio-posterior emargination. Ventral wall between cucullus base and vincular lobes finely wrinkled; vincular lobes stout, with oblique apex, mesio-dorsal surface densely and finely setose; saccus very slender and thin, slightly Y-broadened basally, about 1.3x length of valva, apex slightly dilated. Cucullus basally narrow, inner (ventral) margin with rounded lobe in distal third and with outer wall finely setose, distal ¼ slender, digitiform, extended beyond apex of uncus. Sacculus strongly downcurved at almost 90° (appearing incurved in flattened preparation), apex widened and shallowly concave with weakly pointed tip. Paired glandiductor lobes needle-like, outwardly and upwardly curved, slightly sinuate, slightly longer (1.1x) than phallus, anterior third slightly and gradually widened. Phallus straight, apex with small triangular thorn projected dorsally, slightly longer (1.24x) than saccus, caecum bulbous, about 0.15x length of phallus, inception of ductus ejaculatorius dorso-anterior on caecum.

**Female genitalia.** Unknown.

**Diagnosis.** Externally *A. conspersa* is pale grey brown with a pair of faint darker discal spots on the upper surface of forewings. It can be distinguished from other *Agonochaetia* by the male genitalia: the saccus is very long and thin (1.31x longer than the valva), the vincular lobes are in a U-shape arrangement, densely setose, with oblique apices and narrow anterior ends, separated by a wide, trapezoid emargination, the apex of the sacculus is dilated with a concave margin and a produced tip, and the glandiductors and phallus are very long and slender (GL/VLL = 1.66). The apex of the sacculus in *A. conspersa* is widened with a concavity and a weakly produced point (Fig. 29), a character shared only by *A. shawinigan*, from which it can be distinguished by the uncus without an apical indentation, the U-shaped vincular emargination and the vincular lobes with a wide and oblique apex and a narrow base; in *A. shawinigan*, the uncus has a small apical indentation, the vinculum has a V-shaped emargination, and the vincular lobes are hump-like and apically rounded.

**Biology.** Unknown.

**Distribution.** Western USA and Canada. Known from Colorado, Montana (Glacier National Park) Alberta (Waterton Lakes, Banff National Park), California (Tulare Co. in the Sierra Nevada), and South Dakota (Black Hills).

**Remarks.** In the original description, Braun stated the exact type locality as McDermott Lake in Glacier

National Park, but this is not reflected on the holotype labels. The upper surface coloration varies among the few specimens examined: the type and one specimen from Waterton Lakes are pale brown, nearly beige, whereas a specimen from Banff and another from Colorado are dark brown. Most specimens are nearly or over 100 years old and some fading may have occurred. The male genitalia have never been previously described nor illustrated. A record from Massachussettes, "Martha's Vineyard, late June—early July" (Jones & Kimball 1943: 172, #8064) could not be verified but is almost certainly a misidentification.

### 2. *Agonochaetia impunctella* (Caradja, 1920)

(Figs. 2, 37)

*Brachmia impunctella* Caradja 1920: 111. Type locality: Kasakewitsch, Khabarovsk Krai, Russia.
*Aristotelia impunctella* (Caradja); Park 1996: 66, 70, pl. 4, fig. 40 [not 43 as labelled in Park's figure legend but correctly indicated in his text]).
*Agonochaetia impunctella* (Caradja); Ponomarenko 2008b: 98.

**Material examined.** Holotype ♀, "Kasakew." "HOLOTYPE Brachmia impunctella ♀ Car. ROMÄNIA" (MGAB). Photos of the type, its labels and the genitalia slide (prepared by Park, 1996) were examined.

**DNA Barcode BIN.** Not barcoded.

**Adult (Fig. 2).** The original description is relatively brief and cover the external aspect only: "Close to *Brachmia modicella*, somewhat larger, wings rounded and stretched at the apex. Palps, sensor yellow, last not ringed. General color light-yellow clay. The dot at the beginning and end of the cell and in the crease barely indicated; no dark spot at the interior angles or along the seam and above the tip. Hindwing and fringes light-yellow clay." (Caradja 1920). [Description translated from German.]

Description (based on photograph of the holotype). Adult. Wingspan not measured (scale not available from the photo obtained). Labial palpus light grey-brown, darkest on outer surface of segment 2; segment 3 shorter than segment 2. Antenna light grey-brown, indistinctly darker ringed. Head, thorax and tegula light grey-brown. Forewing light brown mottled with darker scales, especially in apical part; a black streak along fold; indistinct black stigmata at 2/3 and 3/5 in middle of wing; fringes grey. Hindwing grey with grey cilia.

**Male genitalia.** Unknown.

**Female genitalia (Fig. 37).** Segment VIII slightly shorter (0.7x) than wide, without distinct sclerotized modifications, with short longitudinal folds posteroventrally; anterior apophysis about 2.4x length of segment VIII, base gradually widened into sternum VIII; antrum funnel-shaped, about 1.5x length of SVIII (measured distad of ostium bursae), opening at anterior margin of SVIII, distal edge incised, anterior portion extended to about middle (0.5L) of anterior apophysis; signum acrinoid with equilateral triangular basal plate, hook process straight, about as long as basal plate.

**Diagnosis.** Externally *A. impunctella* is a pale beige species with almost unmarked forewings except for indistinct traces of small darker spots in the terminal portion. However, given that the type specimen is over 100 years old, its coloration could have faded. In the female genitalia, the funnel-shaped antrum is somewhat cylindrical (sides more parallel) especially in the distal two-thirds and the V-like emargination of the posterior edge has convexely curved sides at a distinct, obtuse angle; the signum has an equilateral triangular basal plate that is about the same length as the hook. Other species have a differently shaped antrum and signum, however, marked variation in the shape of these structures in two preparations of *A. terrestrella* suggests to interpret these differences with caution pending discovery of more material.

**Biology.** Unknown.

**Distribution (Fig. 43).** Only known from the type locality in Russia's Far East.

**Remarks.** The genitalia of the unique female holotype were illustrated by Park (1996) but no description of the genitalia nor of the external appearance of the specimen was provided. The description above was developed from high-quality photos of the holotype and its genitalia provided by Mihai Stanescu from MGAB.

*A. impunctella* is superficially similar to *Lutilabria kaszabi* Povolný, 1978 from Mongolia and Zabaikalskiy krai of Russia.

### 3. *Agonochaetia incredibilis* Povolný, 1965
(Figs 3, 30)

*Agonochaetia incredibilis* Povolný 1965: 487. Type locality: Margellan, Uzbekistan. Povolný 2002a: 105.

**Material examined.** Holotype ♂ "Margel- | lan | 85. Hbr." [brown hand-written]; "Agonochaetia | incredibilis | Povolný, 1965" [white hand-written]; "HT" [white hand-written]; "St. 321" [dissection label, yellow typed]; "Gemalt von | Dr. F. Gregor | für Micr. Pal." [printed orange] (ZMHU) (examined).

**DNA Barcode BIN.** Not barcoded.

**Adult (Fig. 3).** Forewing length 5.8 mm; wingspan 12.6 mm. Forewing upper surface pale greyish brown suffused with darker brown scales, the latter forming an indistinct postmedian spot and lining the base of the apical and terminal fringe.

**Male genitalia (Fig. 30).** Tegumen with TGN/TGL = 0.67, latero-ventral flange large and broadly rounded. Uncus trapezoid, 0.38x length of tegumen, apical margin rounded and medially cleft. Gnathos proximal arms short, thin, apices club-like and not mesially joined; mesio-distal arm indictinct. Culcitula a large, elongate, pouch-like lobe extended from near apex of uncus to below apex of proximal arms of gnathos. Vinculum transverse, distal margin with broad U-shaped mesial emargination (difficult to make out in the unspread holotype slide). Cucullus narrow, digitiform, with rounded and incurved apex. Sacculus with apex club-like, incurved. Paired glandiductor lobes needle-like, outwardly curved, longer than phallus, anterior 1/4 dilated. Phallus straight, stubby, apex with irregularly quadrate tooth, caecum only slightly wider than shaft.

**Female genitalia.** Unknown.

**Diagnosis.** *A. incredibilis* can be distinguished from other *Agonochaetia* by the tip of sacculus which is rounded and club-like, the cucullus without broad rounded lobe in the distal half, and most remarkably by its stubby phallus proportionally much shorter than the glandiductors. In all other *Agonochaetia* species, the phallus is slender and almost as long as the glandiductors, and the distal half of cucullus is broadened into a rounded ventral lobe.

**Biology.** Unknown.

**Distribution (Fig. 43).** Only known from the holotype collected in Uzbekistan.

**Remarks.** The holotype genitalia were slide-mounted unspread with the glandiductors in situ but the phallus removed, thus its description is not based on an unrolled preparation as with the other species, making comparisons problematic. This is the type species of *Agonochaetia* and it is the only known specimen of the species. Povolný qualified the moth as "small" but it is difficult to figure out the context he was referring to because *A. incredibilis* was the only species included in the genus at the time.

After Povolný's death the holotype of *A. incredibilis* has temporarily been passed to SMNK along with many other types of Gelechiidae which were borrowed from various European museums. It will be soon transferred to the Museum für Naturkunde in Berlin as it belongs to the Staudinger collection deposited in that institution.

### 4. *Agonochaetia intermedia* Sattler, 1968
(Figs 4–5, 31, 38)

*Agonochaetia intermedia* Sattler 1968: 120. Type locality: Sarepta [Krasnoarmeysk], Russia. Huemer (1989: 387); Elsner *et al.* (1999: 49); Povolný (2002a: 105); Huemer & Karsholt (2010: 296).

**Material examined.** Holotype ♂ "S- Russia, Sarepta, 10.7.1864, H. CHRISTOPH", "Microlepid. Brit. Mus. Nat. Hist., slide 3887" (BMNH) (examined by PH).

3 ♂, Kazakhstan, 48°29'15''N, 58°31'14''E, Mugozhary mts., 450 m, Berchogur vill. 3 km NW, 4.vi.2011 (K. Nupponen) (NUPP); 1 ♂ Russia, Orenburg distr., 12 km S Kuvandyk, mountain hilly steppe, 13–15.vi.1998, leg. J. Junnilainen (ZMUC); 1 ♂, Russia, Altai Mnts., 50°14–16'N, 87°40'E, Chuja valley, 1500 m, Aktash village 5 km SE, 5.vii.2000 (K. & T. Nupponen) (NUPP); 1 ♂ Russia, S-Buryatia, 50°58–59'N, 106°38-40'E, 550-600 m, Chikoy valley, Novoselenginsk vill. 10 km S, sand dunes/sandy steppe, 25.vi.2002 (K. Nupponen) (gen. slide 183/16, O. Bidzilya) (NUPP); 2 ♂ Russia, Buryatia, 54°55' N, 111°14' E, Barguzin valley, 600 m, Djirga st., Betula/mead., 10.vii.1996 (Jalava & Kullberg) (gen. prep. in glycerol) (MZH); 1 ♂ [Russia], Transbaikalia, Chita reg.,

Kyra, 900 m, 6.vii.1997 (Bidzilya, I. & O. Kostjuk) (gen. slide 184/16, O. Bidzilya) (ZMKU); 1 ♂, Austria, Teriolis sept., Fließ, 1000 m, 17.v.1975 (K. Burmann) (wing slide JFL 1754) (TLMF); 1 ♂, Austria, Teriolis sept., Fließ, 1000 m, 1.vi.1978 (K. Burmann) (ZMUC); 1 ♂, ditto but 3.vi.1983 (TLMF); 1 ♀, ditto, but 20.vi.1987 (P. Huemer) (gen. slide GU 87/107 P. Huemer) (TLMF); 1 ♂, Austria, Nordtirol, Zams, Steinseehüttenweg, 880 m, 7.vi.2013, (P. Huemer) (TLMF); 1 ♀, Switzerland, Zermatt, 19.vii.1934 (gen. slide GP ETH 1160 W. Sauter) (ETHZ).

**DNA Barcode BIN.** BOLD:ABV4430 (n=2). The average intraspecific divergence of the barcode region is 0.0%, and the minimum distance to the nearest neighbor, *A. shawinigan,* is 8.99%.

**Adult (Fig. 4–5).** Wingspan 15–19 mm. Sexually slightly dimorphic. Male with forewing upper surface grey brown mottled with yellow brown (especially in fold) and black (especially along costa and termen). Hindwing grey with pale cilia. Female upper surface pale yellow brown mottled with few darker scales, forewing without spots.

For a re-description see Huemer & Karsholt (2010: 296).

**Male genitalia (Fig. 31).** Tegumen anterior notch roundly V-shaped (TGN/TGL = 0.55). Uncus 0.4x length of tegumen, apical margin lined with several fine setae, without indentation. Gnathos with proximal arms stubby, apices club-like and not mesially joined; mesio-distal arm free from proximal arms, an indistinct band in apical part of culcitula. Vinculum mesio-posterior emargination shallow, rounded, ventral wall between cucullus base and vincular lobes smooth; vincular lobes pointed, setation of mesio-dorsal surface short and sparse; anterior notches rounded; saccus moderately slender and V-shaped, distinctly shorter than valva (SAL/VLL = 0.66). Cucullus with ventral edge roundly protruded in distal third, apex pointed. Sacculus curved at 90°, basal portion thicker, apex pointed. Glandiductor lobes sinuate, same length as phallus, anterior ¼ strongly bulbous. Phallus straight, apex with triangular projection dorsally, 1.5x length of saccus, caecum moderately bulbous, 0.25x length of phallus.

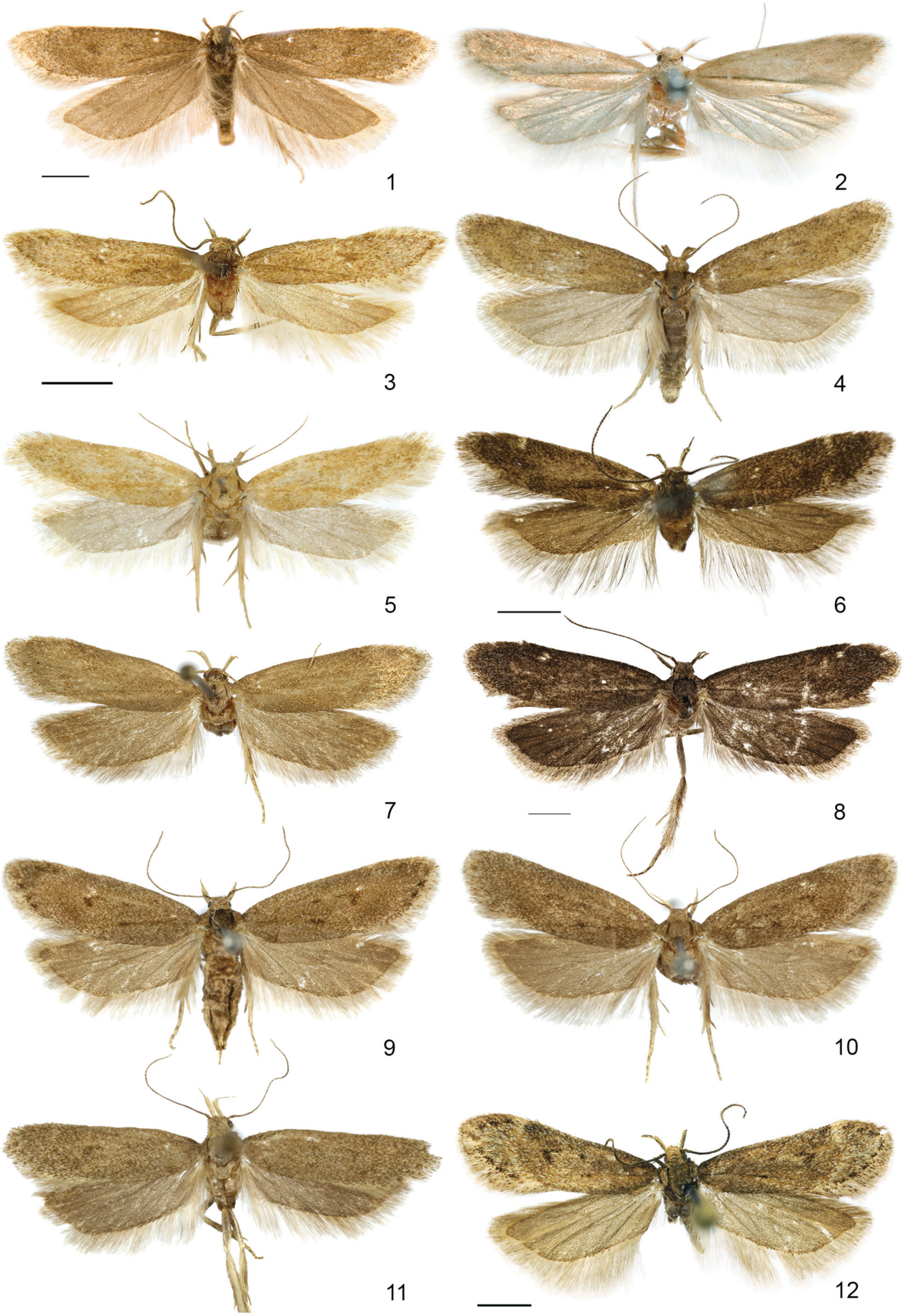
**Female genitalia (Fig. 38).** Segment VIII shorter (0.5x) than wide, weakly sclerotized; anterior apophysis 3.5x length of segment VIII, widening of base into sternum VIII over about ¼ of its length; antrum funnel-shaped, about 1.9x length of SVIII, distal edge shallowly incised, anterior portion tapered to about ¼ distal width and extended to about 1/3 of anterior apophysis; signum with irregularly triangular basal plate with bowed sides, hook stout and slightly longer (1.3x) than basal plate.

**Diagnosis.** Externally the male resembles *A. terrestrella* and *A. quartana* but with more slender wings and darker second segment of the labial palpus. In male genitalia, *A. intermedia* has the tip of the sacculus that tapers off to a sharp point. In that respect it is similar to *A. lvovskyi* and *A. terrestrella*, from which it can be distinguished by its prominent and triangular vincular processes (not raised and square in *A. lvovskyi*), and rounded ventral edge of the cucullus (sub-triangular and prominent in *A. terrestrella*). In female genitalia, the antrum is shaped like a triangular funnel with slightly sinuate sides and a shallowly indented posterior margin. The basal plate of the signum is shaped like a triangle with slightly bowed sides and the signum hook is stout and as long as the basal plate.

**Biology.** Unknown. Adults have been collected from late May to July in xeromontane habitats up to elevations of about 2000 m. They fly at dusk and are attracted to light (Huemer & Karsholt 2010).

**Distribution.** Scattered records from southern Switzerland, western Austria, Lower Volga-region, southern Ural Mountains (Huemer & Karsholt 2010), southern Siberia (Altai, Tuva, Buryatia, Zabaikalskyi krai) in Russia, and western Kazakhstan. For records from Japan see under Remarks.

**Remarks.** Sakamaki & Ueda (2013) reported two male specimens of *A. intermedia* from Hokkaido, Japan (Fig. 43), now deposited in the Kagoshima University. A closer examination of photos of the adults and male genitalia of these moths (Sakamaki, pers. comm.) shows a close affinity to *A. intermedia,* but prominent discal and postmedian spots on the adult forewing are more similar to *A. tuvella.* It is also possible that these moths represent the male of the geographically proximate taxon *A. impunctella*, known only from a faded female specimen from Russian Far East.




**FIGURES 1–12.** Adults. 1, *A. conspersa* ♂ (HT); 2, *A. impunctella* ♀ (HT); 3, *A. incredibilis* ♂ (HT); 4, *A. intermedia* ♂; 5, *A. intermedia* ♀; 6, *A. lvovskyi* ♂ (HT); 7, *A. quartana* ♀ (HT); 8, *A. shawinigan* ♂ (HT); 9–11, *A. terrestrella* ♀♀; 12, *A. tuvella* ♂.

**5. *Agonochaetia lvovskyi* Bidzilya, 2001**
(Figs 6, 32)

*Agonochaetia lvovskyi* Bidzilya 2001:162. Type locality: Shebalino, Altai, Russia. Povolný (2002a: 105).

**Material examined.** Holotype ♂ "Russia, Altai, Shebalino, 22 Jun 1998, A.L. Lvovsky leg." (ZIN); 1 ♂, [Russia], Gornyi Altai, Ongudai.[sky] r-n, middle stream of Inja river, 28 Jun 1989 (Artemieva) (gen. slide 163/15, O. Bidzilya) (ZMKU) (examined).

**DNA Barcode BIN.** Not barcoded.

**Adult (Fig. 6).** Wingspan 13–16 mm. Head and thorax grey brown. Labial palpus recurved, segment 2 brown, outer and upper side mixed with light grey, inner surface light grey to white, segment 3 brown mixed with white; Antenna light brown. Forewing nearly uniform brown to black, mottled by dark and ochreous scales. Indistinct oblique light brown fascia extending from the base of wing towards to anal angle; diffuse pale costal and tornal spots on ¾, black spots in fold, two indistinct markings in cell. Cilia light brown. Hindwing almost black, as dark or darker then forewing, with grey cilia.

**Male genitalia (Fig. 32).** Tegumen sub-triangular in basal half, with broad, evenly arched anterior notch (TGN/TGL = 0.41). Uncus elongate, narrowed apically, with triangular incision at the top. Gnathos ring-shaped. Valva broad, widened medially, apex pointed, extending over the top of uncus. Sacculus 2–2.5x narrower and about 1/3 shorter than valva, curved inwards in distal 1/3, with small apical thorn. Posterior margin of vinculum with short medial humps, medial incision narrow, lateral projections broadly rounded. Saccus slender, about as long as tegumen and uncus. Glandiductor lobe needle-shaped, about length of phallus, weakly broadened at base. Phallus slender, straight, apex with triangular arm, distinctly longer than saccus, caecum weakly swollen, about 1/5 length of phallus (Bidzilya 2001; Povolný 2002a).

**Female genitalia.** Unknown.

**Diagnosis.** Superficially *A. lvovskyi* is characterized by dark, nearly black, rather than brown, forewings. In male genitalia, *A. lvovskyi* differs from other *Agonochaetia* by the broader cucullus with an acute apex, long and extremely thin saccus (SAL/VLL = 0.87), and short, square, almost truncate, vincular lobes.

**Biology.** Unknown. The holotype and another male were collected in late June.

**Distribution (Fig. 43).** Russia: Altai.

**Remarks.** The glandiductors of the only dissection available, illustrated in Fig. 32, have broken tips. Their probable relative length was inferred from memory by OB.

**6. *Agonochaetia quartana* Povolný, 1990**
(Figs 7, 39)

*Agonochaetia quartana* Povolný 1990: 150, figs. 3, 11. Type locality: Slivno, Bulgaria. Povolný (2002a: 105); Huemer & Karsholt (2010: 297).

**Material examined.** Holotype ♀ [Bulgaria] "Slivno, Rebel, Juni 96", "Mn. 3222", "Holotypus det. Povolný, Agonochaetia quartana n. sp., 1990" (ZSM) (examined by OK).

**DNA Barcode BIN.** Not barcoded.

**Adult (Fig. 7).** For a re-description see Huemer & Karsholt (2010: 297).

**Male genitalia.** Unknown.

**Female genitalia (Fig. 39).** Segment VIII shorter (0.85x) than wide, weakly sclerotized, sides finely wrinkled; anterior apophysis 1.4x length of segment VIII, widening of base into sternum VIII over about ½ of its length; antrum slenderly triangular, 1.5x length of SVIII, distal edge roundly concave, anterior portion tapered to about ¼ distal width and extended to about three-quarters of anterior apophysis; signum with elongate triangular basal plate with straight sides, hook small and shorter than basal plate.

**Diagnosis.** The only known specimen of *A. quartana* has broad, almost unicolorous wings. It is similar to *A. terrestrella*, but lacks dark spots in the forewings and has the antennae more distinctly ringed. The female antrum is shaped like a very slender triangular funnel with an incompletely melanized anterior half and a broadly concave posterior margin. The basal plate of the signum is shaped like an elongate isosceles triangle and the signum hook is

short, about half the length of the basal plate. It differs from *A. intermedia* in the more slender antrum with straight sides, and from *A. terrestrella* in the signum with a proportionally more elongate basal plate and shorter distal hook.

**Biology.** Unknown. The holotype was collected in June.

**Distribution (Fig. 43).** Known only from the type locality in Bulgaria.

**Remarks.** *A. quartana* was described from a single female collected in Bulgaria and no additional material has been found. The type locality was erroneously assigned to the Julian Alps in former Yugoslavia (now Slovenia) by Povolný (1990) but it is in fact situated in Bulgaria. The holotype was collected by Hans Rebel, a famous Austrian lepidopterist and former director of the Natural History Museum in Vienna, during an expedition to Bulgaria in 1896. According to Rebel (1903) all material collected at that time is property of the Natural History Museum in Vienna and not of ZSM as stated by Povolný (1990). It seems likely that the holotype is one of the two specimens published as dark form of *Lutilabria lutilabrella* (Mann, 1857) [*Gelechia lutilabrella*] (Rebel 1903). Povolný (1990) distinguished the species solely on the shape of the signum of the holotype, even though the shape of the antrum, which he considered to afford differences among species of *Agonochaetia*, falls within the individual variation of *A. terrestrella.* Therefore those two taxa may well prove to be conspecific in the future (Povolný 2002b; Huemer & Karsholt 2010). See also Remarks under *A. terrestrella*.

### 7. *Agonochaetia shawinigan* Landry, sp. nov.

(Figs 8, 33)

urn:lsid:zoobank.org:act:63E1C708-2C93-4083-8E6A-89476968F237

**Type material.** Holotype ♂ : "QUÉBEC | St-Maurice | Notre-Dame-du- | Mont-Carmel | 24 Jun 1996, au vol | leg. L.-P. Landry" [white label]; CNCLEP | 00002751" [white label]; "genitalia dissection | MIC 4240 ♂" [green label]; "Agonochaetia| sp. '98 | R.W. Hodges" [white hand-written label]; "Barcode of Life Project | Leg removed | DNA extracted" [blue label]; "HOLOTYPE ♂ | Agonochaetia | shawinigan | J.-F. Landry" [orange, partly printed, partly hand-written] (CNC).

**DNA Barcode BIN.** BOLD:AAH8547 (n=1). The minimum distance to the nearest neighbor *Lutilabria lutilabrella* is 7.7%.

**Adult (Fig. 8).** Wingspan 21 mm. Head grey brown, collar ochreous brown. Thorax and tegulae dark brown. Labial palpus slender, segment 2 nearly twice length and width of segment 3, without pecten; both segments mottled with brown and creamy scales, darker on the outer surface. Antenna dorsally dark brown, flagellomeres each with proximal row of scales brown and distal row contrastingly dirty white; scape without pecten. Forewing uniformly dark brown without spots or fasciae, individual scales with pale creamy base and dark brown two-thirds; terminal fringe greyish white suffused with dark brown. Hindwing upper surface dark brown, darker than forewing, ciliae brownish grey suffused with brown; underside paler grey brown.

**Male genitalia (Fig. 33).** Tegumen elongate with deep and roundly arched anterior notch (TGN/TGL = 0.54). Uncus trapezoid, 0.4x length of tegumen, anterior margin fused to distal margin of tegumen and with delineation from latter somewhat indistinct as a dorso-lateral sulcus/impression, apical margin transversely straight, lined with several short setae, with shallow medial indentation. Gnathos with proximal arms short, stubby, apices club-like and not mesially joined; mesio-distal arm free from proximal arms, reduced to small, thin, bracelet-like sclerotized band embedded in apical part of culcitula. Culcitula a large, elongate, pouch-like lobe extended from apex of uncus to slightly below apex of proximal arms of gnathos. Vinculum transverse, with deep V-shaped medio-posterior emargination, ventral wall between cucullus base and vincular lobes finely wrinkled; vincular lobes large, stout, rounded and hump-like, mesio-dorsal surface densely and finely setose; saccus very slender and thin, slightly broadened basally, about 1.6x length of valva, apex slightly dilated. Cucullus narrow, inner (ventral) margin roundly widened in distal third and with outer wall finely setose, distal ¼ slender, digitiform, extended beyond apex of uncus. Sacculus strongly downcurved at almost 90° (appearing incurved in flattened preparation), apex widened and shallowly concave with acuminate tip. Paired glandiductor lobes needle-like, outwardly and upwardly curved, slightly sinuate, slightly longer (1.1x) than phallus, anterior half dilated. Phallus straight, apex with small triangular thorn projected dorsally, slightly longer (1.2x) than saccus, caecum bulbous, about 0.15x length of phallus, inception of ductus ejaculatorius dorso-anterior on caecum.

**Female genitalia.** Unknown.

**Diagnosis.** Externally *A. shawinigan* is an unmarked dark brown species with the hindwing upper surface darker than that of the forewing. In genitalia the saccus is the longest of all *Agonochaetia* species (1.58x longer than the valva) and very thin, the vincular lobes are large, densely setose and in a V-shape arrangement with rounded apices and wide anterior ends, the apex of the sacculus is dilated with a concave margin and a produced, acuminate tip, and the glandiductors and phallus are very long and slender (the most of any *Agonochaetia* species with GL/VLL = 2.05).

In male genitalia *A. shawinigan* is similar to *A. conspersa* in having the saccus longer than the valva (SAL/VLL = 1.58 in *A. shawinigan*; 1.31 in *A. conspersa*) whereas the saccus is shorter than the valva in all Palearctic species (SAL/VLL ratio = 0.66–0.89). In *A. conspersa*, the vinculum lobes are arranged in a broad U-shape with oblique apices and narrow anterior ends, the medio-posterior emargination is trapezoid, and the apex of the sacculus, although dilated, is indistinctly concave and the tip pointed and less produced.

Superficially *A. shawinigan* resembles the Central Palearctic *A. lvovskyi* in having the upper surface dark brown, but in the latter species the hindwing is not darker than the forewing and the forewing has a small pale costal spot distally. The hindwing upper surface being noticeably darker than the forewing is an unusual feature for Gnorimoschemini and Gelechiidae in general, in which the hindwing upper surface paler than the forewing is the overwhelmingly prevalent state.

**Etymology.** "Shawinigan" is a transliteration of an aboriginal Abenaqui expression, which means "sloped portage", "portage on the crest", or "angled portage". It refers to the narrow and steep portage at the base of the first falls on the Saint-Maurice River (up from the Saint-Lawrence River of which the Saint-Maurice is a tributary). The location is where the original town of Shawinigan was established in the 1800s. The locality of Notre-Dame-du-Mont-Carmel where the type specimen was discovered by Léo-Paul Landry is a parish municipality in the Mauricie region of Québec, which is now included in the City of Shawinigan. The Abenaqui are the aboriginal people who inhabited the region when the French explorers arrived in the early 1600s. The species name is a noun in apposition.

**Biology.** Unknown. The holotype was collected in flight during the day in late June in a rural backyard with sod over sandy soil. Although the grounds were regularly mowed, the adjacent property was not maintained and was covered with milkweed (*Asclepias syriaca*) and other weedy forbs. The housing development was built over abandoned agricultural lands with a dominant vegetation of *Acer rubrum* and *Larix laricina* interspersed with shrubs on sandy ridges.

**Distribution (Fig. 43).** Known from a single specimen from the type locality in Québec.

**Remarks.** The apparent small pale costal spots visible near the apex of the forewings of the holotype of *A. shawinigan* (Fig 8) are pin marks. The very dark hindwings in this otherwise non-descript brown gelechiid is what attracted JFL's attention when he first saw the specimen among a lot of unidentified Gelechiidae brought to him by the collector Léo-Paul Landry.

### 8. *Agonochaetia terrestrella* (Zeller, 1872)

(Figs 9–11, 34, 40–41)

*Gelechia terrestrella* Zeller 1872: 111. Type locality: Bergün, Switzerland. Lectotype designated by Sattler (1961) (BMNH). Elsner *et al.* (1999: 49); Povolný (2002a: 106); Huemer & Karsholt (2010: 295).

= *Gelechia muestairella* Müller-Rutz, 1922: 241. Type locality: St. Maria, Münstertal, Switzerland. Synonymized by Sattler (1961).

**Material examined.** *Gelechia terrestrella*: Lectotype ♂: "Lecto-Type", "Type" "2/7", "Bergün", "71", "terrestrella Z., E.Z. 1872", "ZELLER COLL, WALSINGHAM collection, 1910-427", "Type". (BMNH) (examined by PH).

1 ♀, Switzerland, Graubünden, St. Maria im Münstertal, 29.vi.1923 (H. Thomann) (gen. slide 06/1254 ♀ P. Huemer) (BNMC). 1 ♀, Romania, Dobrogea, Rez. Canaraua Petii, 17.v.1994 (S. & Z. Kovacs) (gen. slide 04/1216 ♀ P. Huemer) (TLMF).

*Gelechia muestairella*: No holotype or lectotype seems to have been designated. Müller-Rutz (1922) mentioned that several specimens were collected by H. Thomann at the type locality on 26 Jun 1919. Additional specimens were later collected at the type locality in late June 1923 and 1926 (Thomann 1956), thus are not

syntypes. Sauter (1961) studied and illustrated the genitalia of one male collected on 29 June 1923 in the Thomann collection (BNMC). Sattler (1961) examined two males collected by Thomann on 29 Jun 1919 and 29 Jun 1923 respectively, the first is likely a syntype (BNMC).

**DNA Barcode BIN.** BOLD:ABV4431 (n=1). The minimum distance to the nearest neighbor *A. shawinigan* is 8.37%.

**Adult (Figs. 9–11).** Wingspan 20 mm. Antenna grey brown with distinct paler annulations. Forewing brown with paler-based scales, an indistinct short black streak in fold and two black spots, one discal, one postmedian; termen with a few indistinct black spots. Hindwing dark grey with pale grey cilia.

**Male genitalia (Fig 34).** Tegumen elongate with evenly arched anterior notch (TGN/TGL = 0.43). Uncus 0.3x length of tegumen, apical margin transversely straight, lined with few short setae, with small but sharp medial indentation. Gnathos with proximal arms short, stubby, apices club-like and not mesially joined; mesio-distal arm free from proximal arms, a sizable band embedded in apical part of culcitula. Vinculum transverse, mesio-posterior emargination barely suggested, ventral wall between cucullus base and vincular lobes smooth; vincular lobes thin, pointed, setation of mesio-dorsal surface short; anterior notches rounded; saccus moderately slender and V-shaped, slightly shorter than valva (SAL/VLL = 0.89). Cucullus with ventral edge prominently lobate. Sacculus bent at almost 90°, basal portion thicker, apex mucronate. Paired glandiductor lobes regularly curved or barely sinuate, longer (1.4x) than phallus, anterior ¼ moderately dilated. Phallus straight, apex with sharp triangular thorn projected dorsally, 1.6x length of saccus, caecum bulbous, about 0.25x length of phallus, inception of ductus ejaculatorius dorso-anterior on caecum.

**Female genitalia (Figs. 40–41).** Segment VIII slightly shorter (0.8x) than wide, irregularly wrinkled, weakly sclerotized; anterior apophysis about 1.1–1.9x length of segment VIII, base gradually widened into sternum VIII; antrum funnel-shaped with sides sub-parallel, 1.25–1.6x length of SVIII, distal edge broadly concave, posterolateral corners either prolonged into pointed curve or abbreviated, anterior end extended to about or slightly beyond middle of anterior apophysis; signum acrinoid with equilateral triangular basal plate, hook process straight, about as long or longer than basal plate.

For further description see Huemer & Karsholt (2010: 295).

**Diagnosis.** Externally *A. terrestrella* is a medium brown species with variously distinct dark spots on the forewing. In male genitalia it is distinguished from all other *Agonochaetia* by the large size of the lobe of the ventral edge of cucullus. The proximal arms of the gnathos are the thickest of all the species, and the posterior margin of vinculum mesially is slightly produced into a low and broad lobe, whereas it is incised or emarginate in the other species.

**Biology.** Unknown. Adults fly from late June to July in mountain steppe slopes at altitudes from about 1500 m to above 2000 m. Thomann (1956) found the species in late June 1923 and 1926 on meadows near anthropogenic heaps of stones covered by short vegetation. The moths were not attacked by the extremely common ants in this microhabitat and Thomann concluded an eventual myrmecophily.

**Distribution.** Known from isolated localities in southeastern Switzerland, Albania, and Romania (Huemer & Karsholt 2010).

**Remarks.** Two females collected on the same date at the type locality of *muestairella* (Santa Maria, Münstertal, Switzerland, 29 Jun 1923) display marked differences in genitalia. Considered individually, each of these could be construed to represent a different species, as divergent from each other as they are from any of the other three species for which females are known. This throws some doubt as to the validity of the species based on single females. At this point we elect to keep them together because it would be unwise to describe them as different species or to resurrect *muestairella* as valid without additional specimens and DNA barcodes. Variation in external and genitalia characters among European populations was noted by Huemer & Karsholt (2010: 295).

### 9. *Agonochaetia tuvella* Bidzilya, 2000

(Figs 12, 35)

*Agonochaetia tuvella* Bidzilya 2000: 392, Fig. 6 (♂ genitalia). Type locality: Tuva, Russia.

**Material examined.** Holotype ♂ "Tuva, Ujuk distr., Seserlig, 16.vi.1969,Yu. Kostjuk" (gen. slide 117/15, O. Bidzilya) (ZMKU). 1 ♂, Tuva, 16 km S of Kyzyl, 14-15.vi. 2001, 1000 m, steppe (Ustjuzhanin) (gen. slide 66/03, O. Bidzilya) (BIDZ-00039) (ZMKU) (examined).

**DNA Barcode BIN:** BOLD:ACT4243 (n=1). The minimum distance to the nearest neighbor, *A. shawinigan,* is 8.51%.

**Adult (Fig. 12).** Wingspan 16 mm. Head, thorax and tegulae light grey. Second segment of labial palpus light grey on inner surface, darker with numerous brown scales on outer surface. Third segment greyish brown, paler on inner surface. Antenna light brown. Forewing greyish brown with dark spot in middle of wing about 1/4 length from base, with black chevron mark at 2/3 from base, and a white diffuse spot at 3/4 of costa. Cilia light brown. Hindwing light grey.

**Male genitalia (Fig. 35).** Tegumen elongate with deep and roundly arched anterior notch (TGN/TGL = 0.57). Uncus 0.35x length of tegumen, anterior margin fused to distal margin of tegumen and with delineation from latter somewhat indistinct as a dorso-lateral sulcus/impression, apical margin transversely straight, lined with several short setae, with shallow but sharp medial indentation. Gnathos with proximal arms short, stubby, apices club-like and not mesially joined; mesio-distal arm free from proximal arms, reduced to small, thin, bracelet-like sclerotized band embedded in apical part of culcitula. Culcitula a large, elongate, pouch-like lobe extended from apex of uncus to slightly below apex of proximal arms of gnathos.Vinculum transverse, with shallow V-shaped mesio-posterior emargination, ventral wall between cucullus base and vincular lobes smooth; vincular lobes with sinuate margin, setation of mesio-dorsal surface restricted to near edge; anterior notches angulate; saccus moderately slender and V-shaped with tapered apex, shorter than valva (SAL/VLL = 0.87). Cucullus elongate, digitiform, extended beyond apex of uncus, ventral edge barely widened in distal third. Sacculus bent at almost 90° in basal portion and slightly constricted, apex rounded. Paired glandiductor lobes needle-like, outwardly curved and slightly sinuate in distal portion, slightly longer (1.17x) than phallus, anterior ¼ dilated. Phallus slightly sinuate, apex with sharp triangular thorn projected dorsally, 1.4x length of saccus, caecum bulbous, about 0.25x length of phallus, inception of ductus ejaculatorius dorso-anterior on caecum.

**Female genitalia.** Unknown.

**Diagnosis.** Among the *Agonochaetia* species, externally *A. tuvella* has the most contrastingly marked forewing which is brown densely suffused with beige, particularly in the distal half, with distinct dark spots and a vague subterminal, pale transverse band across the distal third. The postmedian spot at the end of cell is chevron-shaped and the tornal and terminal margin is lined with several elongate spots before the terminal fringe.

In male genitalia, the saccus is narrowly V-shaped with a pointed anterior apex, slightly shorter than the valva (SAL/VLL = 0.87), the vinculum anterior notches are angulate, the vincular lobes are obliquely sinuate and separated mesially by a marked V-shaped indentation of the caudal margin, the sacculus is digitiform and sharply incurved in its basal portion and has a rounded apex, and the ventral edge of cucullus is only slightly dilated.

The male genitalia are closest to those of *A. intermedia*: the latter differs in having a proportionally shorter saccus (SAL/VLL = 0.66), vincular lobes more widely separated with the caudal margin of vinculum barely indented, the sacculus incurved in the middle with a pointed apex, and the cucullus more markedly dilated along the ventral edge.

**Biology.** Unknown. The holotype and another male were collected in mid June.

**Distribution (Fig. 43).** Russia: Republic of Tuva in southern Siberia.

### *Canarischema* Karsholt, gen. nov.

urn:lsid:zoobank.org:act:0C996FF5-3C3B-4D70-A11D-9D4F2CCFF71C

Type species: *Canarischema fuerteventura* Karsholt, sp. nov., by present designation and monotypy.

**Diagnosis.** *Canarischema* is characterized by a unique combination of characters in the male genitalia: 1) a pair of long, needle-like glandiductors with a wide anterior opening; 2) a very long fusiform uncus dorsally with semi-erect setae; 3) a very long and broad gnathos; 4) culcitula absent; and 5) a broad cucullus tapering from middle to pointed apex. The female genitalia are rather uncharacteristic, apart from having the base of the anterior apophysis broadly widened into sternum VIII with the outer edge thickened into a ridge extended to sternum VIII and a small thorn-like signum. For diagnosis of adult see under description of the species.

**Description. Adult (Figs. 13–14).** Rather small (wingspan 9–12 mm) Gnorimoschemini. Labial palpus slender; segment 2 only slightly broader than segment 3; both segments of about same length. Scape of antenna

white; flagellum thickened, yellow in male; slender, ringed blackish brown and white in female. Forewing white with yellow-brown and black-tipped scales; patches of raised black scales (surrounded by yellow-brown) in fold and at ¾ in middle of wing. Hindwing with indistinctly marked sinuation below apex.

**Wing venation (Fig. 16).** Forewing with R1–R5 running to costa; R4 and R5 stalked; pterostigma absent; cell open (damaged in preparation examined); CuP absent. Hindwing with M1 extended from Rs beyond cell; cell open; M3 to terminal margin; CuA1 to ventral margin.

**Abdomen.** Lateral ridges of tergum I (marginosclerites) unmelanized throughout. Sternum VIII in male without coremata.

**Male genitalia (Figs. 27–28, 36).** Tegumen with shallow anterior notch (TGN/TGL = 0.35), posterior margin with "shouldered" appearance. Uncus prominent, fusiform, nearly as long as tegumen, base Y-shaped, apex pointed, dorsal surface of distal half setose. Gnathos very large, proximal arms thick, straight, mesial process extended beyond margin of tegumen notch, tongue-shaped. Culcitula absent. Vinculum transversely very narrow, mesio-posterior emargination shallow; medio-lateral margin finely dentate; vincular lobes undeveloped short, rounded; anterior notches arched; saccus thin, as long as valva (SAL/VLL = 1.0). Cucullus broad, tapering from middle towards pointed apex, ventral edge smoothly curved without protrusion or lobe. Sacculus about half length of cucullus, incurved, inner margin irregular, apex pointed. Paired glandiductor lobes needle-like, longer (1.4x) than phallus, apical portion curved, anterior portion dilated with wide dorsal opening, inner duct wide with large anterior opening. Phallus short, barely longer than saccus, thick, straight, apex with small triangular thorn projected dorsally, caecum slightly bulbous with collar-like constriction around opening of ductus ejaculatorius.

**Female genitalia (Fig. 42).** Segment VIII slightly shorter (0.8x) than wide, irregularly wrinkled, weakly sclerotized; anterior apophysis about as long as segment VIII, base broadly widened into sternum VIII with outer edge thickened into a ridge extended to and almost meeting in setae-covered field at caudal margin of sternum VIII; antrum poorly developed; signum small, acrinoid with crescentic base, laterally with small dents, spine short, curved and sharp.

**Etymology.** The name *Canarischema* is a composition of "Canary" referring to its occurrence in the Canary Islands, and "schema" (Greek: figure or shape). The second part of the name refers to its use in several genera of Gnorimoschemini. Its gender is neutral.

**Biology.** Host plants and immature stages unknown.

**Distribution.** Canary Islands: Fuerteventura.

**Remarks.** We hesitated before deciding to erect a new genus to accommodate the new species *fuerteventura*. The alternative position would have been to assign forcibly the new species to an existing genus where it would have been a misfit. The unique shape of the uncus (elongate-fusiform with prominent erect setae, extended from a markedly elbowed distal margin of tegumen) and gnathos (very large, linguiform mesial process with long latero-proximal arms), and the lack of culcitula precluded assignment to *Agonochaetia* or any other glandiductor-bearing gnorimoschemine genus. These discordant characters coupled with the endemicity of the species on an oceanic archipelago justified, in our view, a separate genus. When present, the culcitula is typically recognizable as an expanded membranous lobe below the anal cone and above or around the outer surface of the gnathos, and is covered with dense spicules.

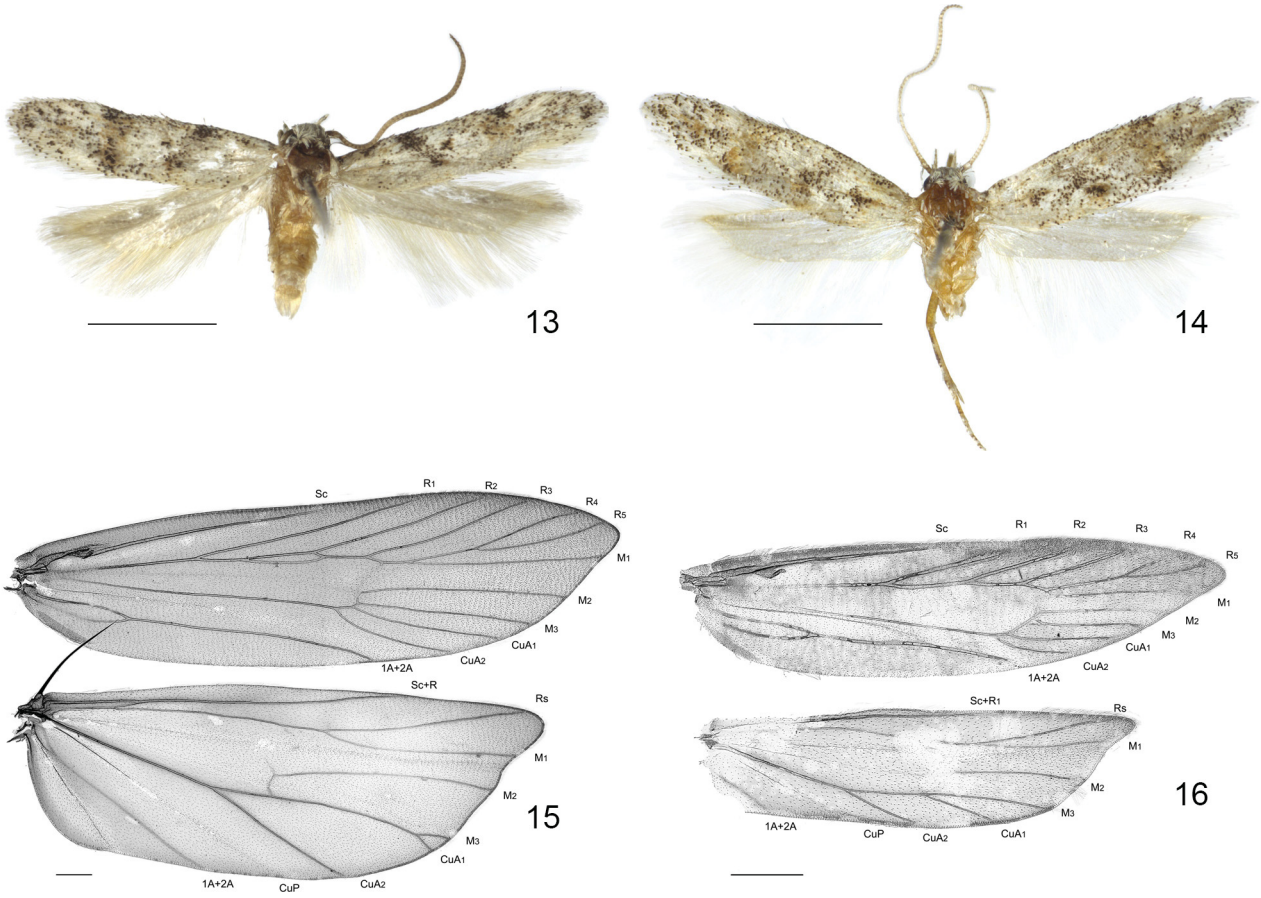
***Canarischema fuerteventura* Karsholt, sp. nov.**
(Figs. 13–14, 16, 20, 22, 27–28, 36, 42)
urn:lsid:zoobank.org:act:B9B264B5-CD83-4A1F-9A61-23535FDAD640

**Material examined.** Holotype ♂, Spain, "Kanar. Inselen Fuerteventura Bco. [Barranco de] Esquinzo, 15.12.2006 – 14.01.2007, leg. R. Paas", "Gen.præparat Nº 6319 ♂ H. Hendriksen" (ZMUC).

**Paratypes.** 3 ♂, same data as holotype; 1 ♂, ditto but 3-16.x.2000; 2 ♂, 25.ix.–19.x.2002; genitalia slide Bidzilya 139/15; 3 ♂, 1 ♀, ditto but 18–24.xii.2003, genitalia slide Bidzilya 138/15; 1 ♂, 1 ♀, ditto but 30.ix.–6.x.2004; 1 ♂, 1 ♀, ditto but 8–24.x.2004; 2 ♂, ditto but 15–31.x.2005; 1 ♀ ditto but 15.x.–8.xi.2008; 1♂, 20.ii. – 15.iii.2011 (AW, CNC, TLMF, WS, ZMKU, ZMUC).

**DNA Barcode BIN.** BOLD:ACZ6649 (n=2).

**Description (Figs. 13–14).** Adult. Male. Wingspan 9–12 mm. Labial palpus slender; segment 2 only slightly broader than segment 3; both segments of about same length, white, each with a broad black band most distinct at outer surface. Scape of antenna white mottled with black; flagellum thickened, yellow. Forewing white mottled with yellow-brown and black-tipped scales; an oblique black fascia from 1/3 of costa to 2/5 at dorsum running through a patch of raised black scales in fold; a transverse black fascia at 3/4 with a distinct patch of raised black scales in middle; both patches of raised black scales surrounded by yellow brown; indistinct costal and tornal spots connected by weak oblique fascia; apical area with many dark scales and some yellow brown in middle; fringes white with black fringe line. Hindwing light grey with white-grey fringes. Female. Flagellum of antenna slender, ringed blackish brown and white. Otherwise similar to male.




**FIGURES 13–16.** Adults and wing venation. 13, *Canarischema fuerteventura* ♂ (HT); 14, *idem.* ♀ (PT); 15, *Agonochaetia intermedia* ♂ (slide JFL 1754); 16, *Canarischema fuerteventura* ♂ (slide MIC 7845). Scale bars: figs 13–14 = 2 mm; figs 15–16 = 500 µm.

**Male abdomen (Fig. 20, 22).** Tergum VIII linguiform-quadrate, anterior margin invaginated, broadly U-shaped, thickened. Sternum VIII distally tapered, conically pointed.

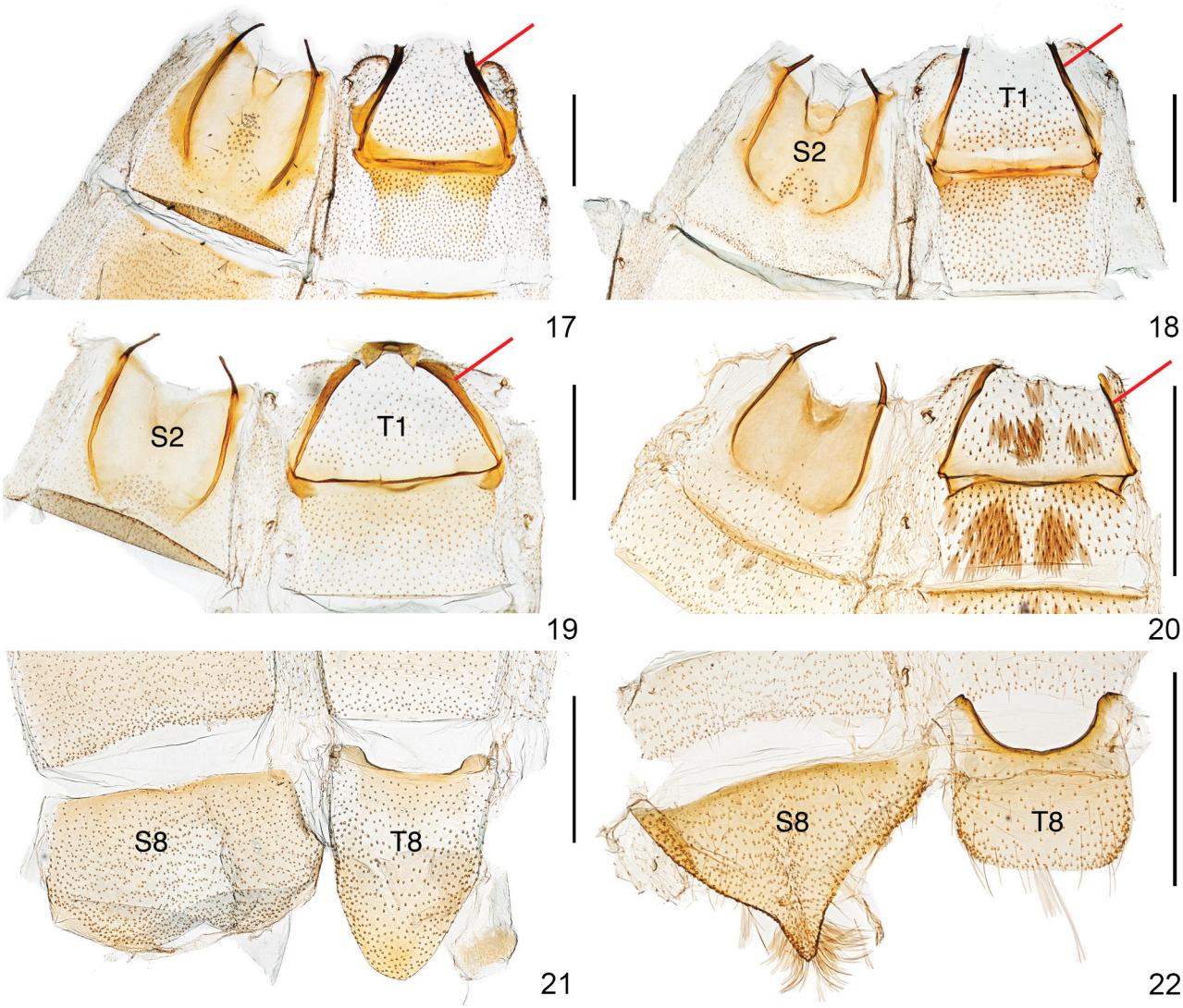
**Male genitalia (Figs. 27–28, 36).** See description of genus.

**Female genitalia (Fig. 42).** See description of genus.

**Variation.** The type series shows only slight variation, apart from being more or less worn.

**Diagnosis.** *C fuerteventura* is characterized by the slender segment 2 of the labial palpus, the thickened flagellum of the male antenna, and by the patches of black scales surrounded by yellow brown in the forewing. In male genitalia, the glandiductors have a wide anterior opening as do the internal ducts.

**Etymology.** *C. fuerteventura* is named after its place of occurrence: the island of Fuerteventura, which is situated in the Atlantic Ocean about 100 km west of Morocco. It is considered the oldest of the Canary Islands, having not been submerged for about 20 million years. The species name is a noun in apposition.




**FIGURES 17–22.** Abdominal segments; 17–20, segments 1–2; 21–22, segment 8. 17, *Gnorimoschema septentrionella* Fyles (slide MIC 7717); 18, *Symmetrischema costaricanum* Povolný (slide MIC 7711); 19, *Agonochaetia conspersa* (slide MIC 6094); 20, *Canarischema fuerteventura* (slide JFL 1755); 21, *Agonochaetia conspersa* (slide MIC 6094); 22, *Canarischema fuerteventura* (slide JFL 1755). Scale bars = 500 µm. Red arrows indicate the marginosclerite of T1.

**Biology.** Early stages and host-plant unknown. The type series was collected at light during the winter months from the end of September to March in mountainous surroundings at low elevation.

**Distribution (Fig. 43).** Only known from the island of Fuerteventura in the Canary Islands (Spain).

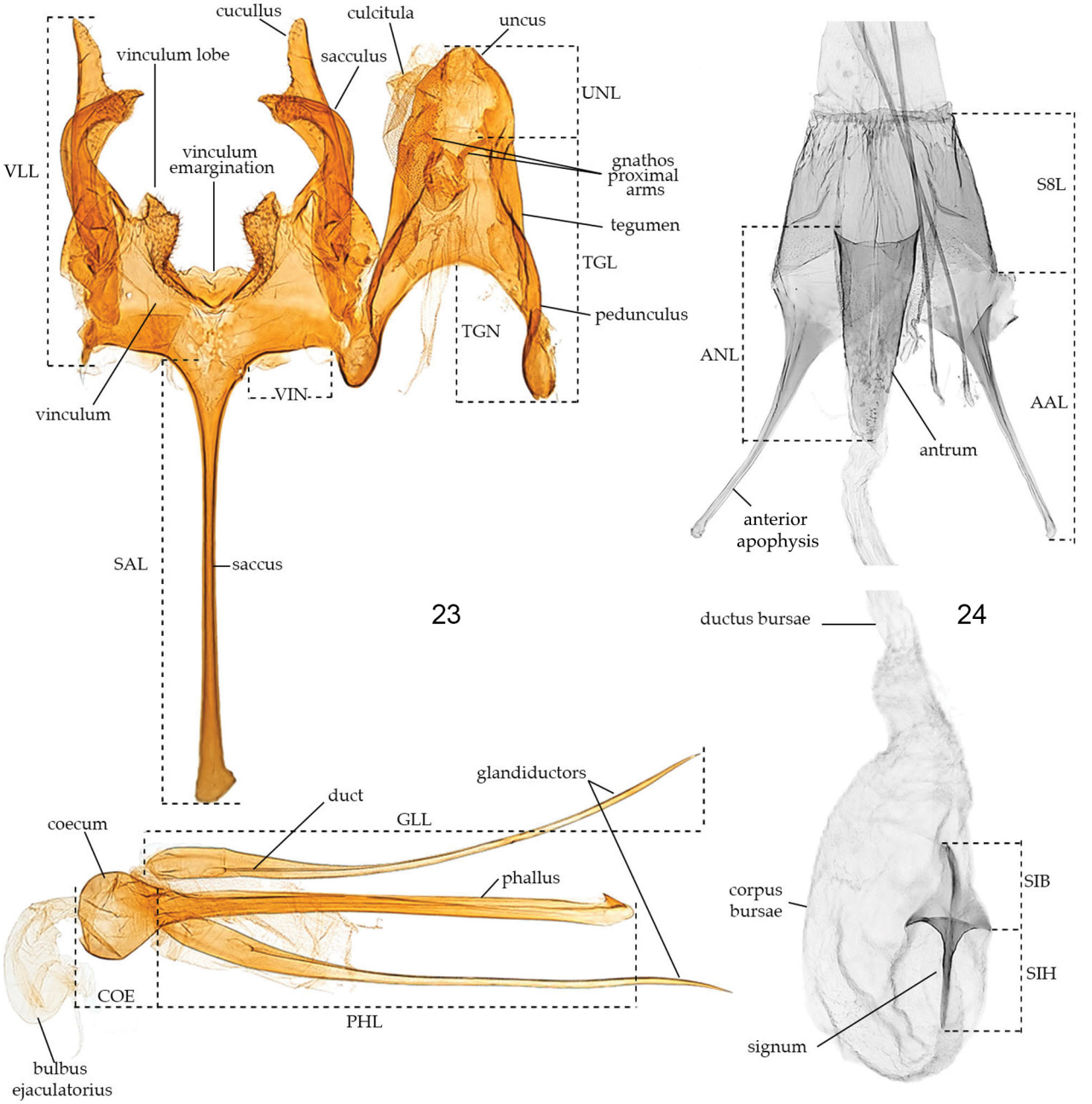
**Remarks.** Patches of raised scales in the forewings are rare in Gnorimoschemini, but are present in the somewhat similar, but smaller species of *Microlechia* Turati. *Canarischema furteventura* may also be mistaken for species of *Ochrodia* Povolný, e.g., *O. subdiminutella* (Stainton), which are common (and often abundant) in dryer parts of the Canary Islands and adjacent North Africa, but *Ochrodia* do not have raised scales. The genitalia of both of these genera differ markedly from those of *C. furteventura*.

## Discussion

*Glandiductors***.** A striking morphological trait shared by all *Agonochaetia* species is a distinctive pair of elongate (as long or longer than the phallus), needle-shaped structures extended from within a deep pocket of the diaphragma and dorsally bracing, but free from, the phallus in the male genitalia. Each of these "needles" contains an internal channel with an inception opening in the dilated anterior (cephalad) end and a tiny opening at the apex.

This feature is also prominently present in the new genus *Canarischema*. In *Agonochaetia* the anterior end of the glandiductors is closed, forming a blind sac, whereas in *Canarischema*, the anterior end has a wide opening separate from but adjacent to the inception of the internal channel.

The term "glandiductors" was proposed for these organs by Ponomarenko (2005) who elucidated that each was continuous with an internal duct and glandular (tissular) sac-like structure. Ponomarenko (2008a) postulated their glandular nature based on their similar morphology (round body, duct with opening) corresponding to similar abdominal organs found in primitive Lepidoptera. The internal duct and soft tissues being digested during KOH maceration accounts for the fact they have been overlooked or misinterpreted previously. The presence of the corresponding internal glands from which the external sclerotized glandiductors extend could not be observed by us in *Agonochaetia* due to the lack of undissected, suitably preserved specimens.



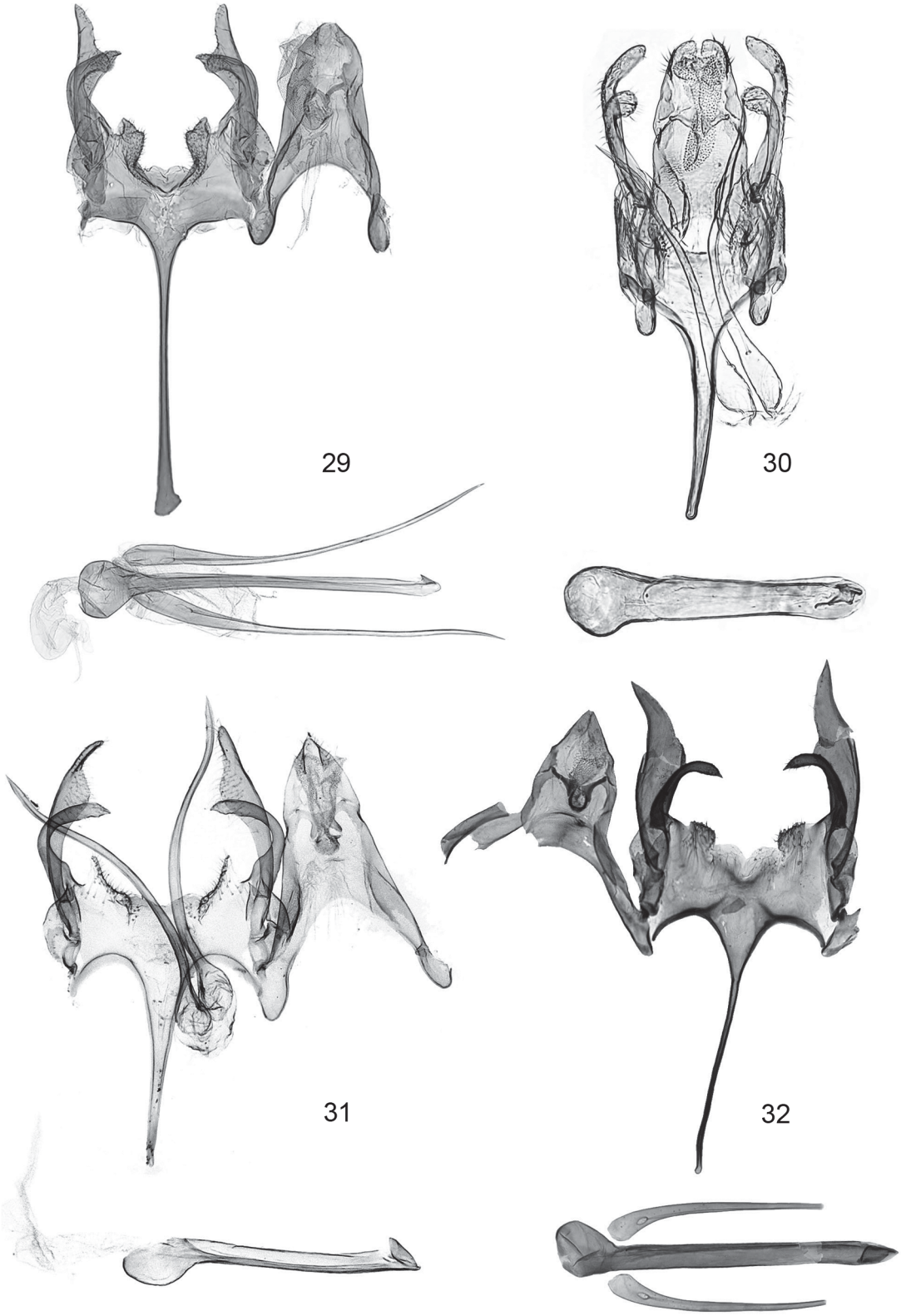

**FIGURES 23–24.** Genitalia terms and abbreviations used in this study. 23, male genitalia; 24, female genitalia. AAL = anterior apophysis length; COE = caecum phalli length; CUL = cucullus length; GLL = glandiductor length; PHL = phallus length; S8L = sternum VIII length; SAL = saccus length; SIB = signum base; SIH = signum hook; TGL = tegumen length; TGN = tegumen notch; UNL= Uncus length; VIN = vinculum anterior notch.


**FIGURES 25–28.** Intact male genitalia, ventral and lateral aspects. 25–26, *Agonochaetia conspersa* (dissection USNM 142571); 27–28, *Canarischema fuerteventura* (dissection MIC 7845)

Among the 44 genera in the tribe Gnorimoschemini (*sensu* Povolný 2002b), in addition to *Agonochaetia* and *Canarischema*, only four others possess glandiductors: *Pogochaetia* Staudinger, *Tila* Povolný, *Insuloschema* Povolný, and *Nevadopalpa* Povolný. According to Ponomarenko (2008a), glandiductors are also found in several genera of Litini (*Recurvaria* Haworth, *Coleotechnites* Chambers, *Exoteleia* Wallengren, *Chorivalva* Omelko, *Stenolechia* Meyrick, *Parastenolechia* Kanazawa, *Nuntia* Omelko, *Schneidereria* Weber, *Teleiodes* Sattler, *Carpatolechia* Capuşe, *Pseudotelphusa* Janse, and *Altenia* Sattler), and *Mirificarma* Gozmány (Gelechiini; so-called 'filament' by Pitkin 1984, p. 12), but with varying size and position. Sattler (1967: figs 7–18) illustrated them in the *Chionodes obscurusella* species-group but did not refer specifically to them. Ponomarenko (2008a) hypothesized that these structures are homologous among these taxa.

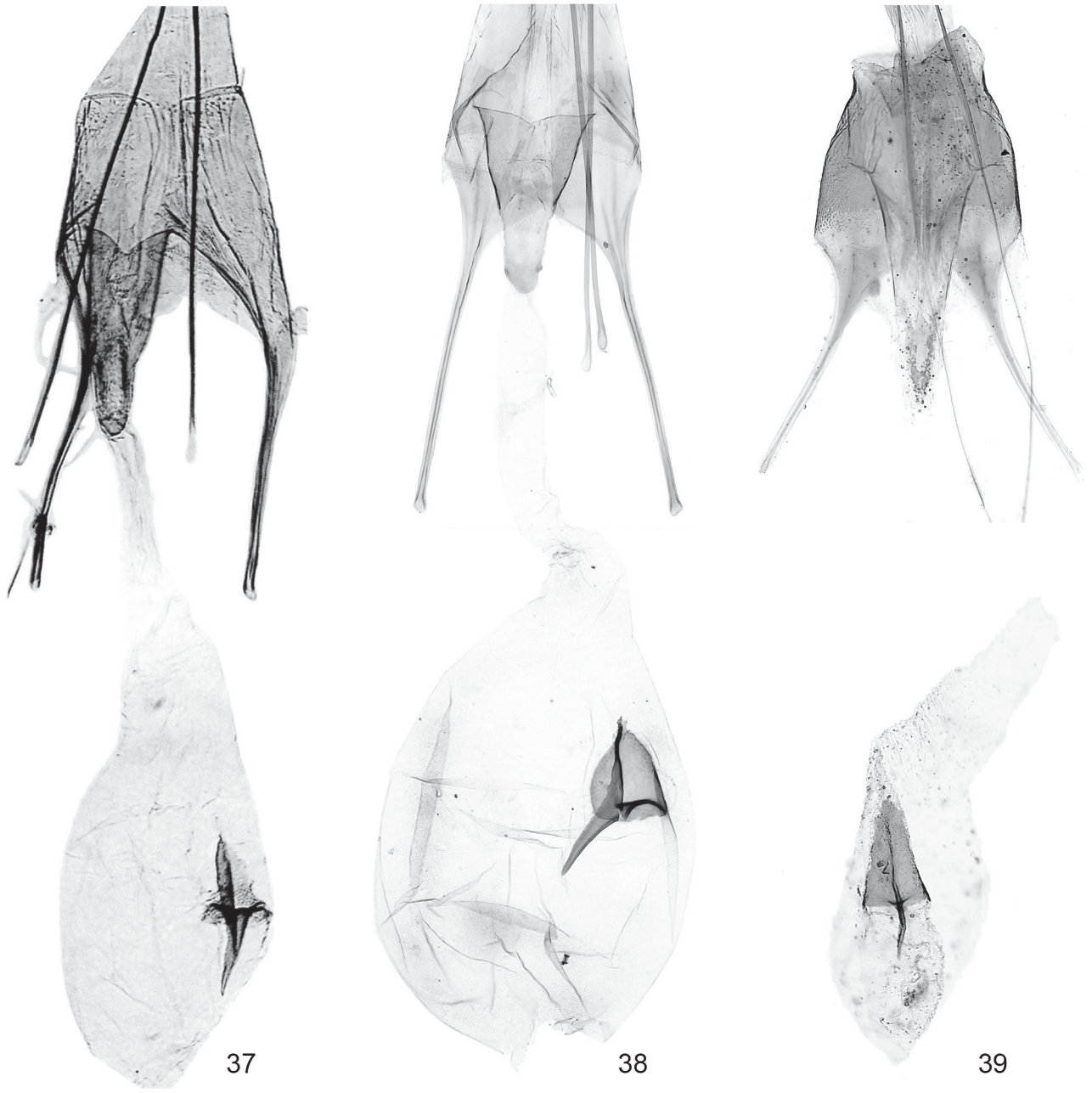
Glandiductor-like structures are also found in the genus *Anarsia* Zeller (Chelariini) (Gregersen & Karsholt 2017), but here they are attached to the complex and asymmetrical valvae. Gregersen & Karsholt (*op cit.*) postulated that "these tubes may be connected with glands and serving for the secretion of male pheromones during courtship and mating".

**Marginosclerites.** One noteworthy feature in *Agonochaetia* is the completely unmelanized marginosclerites of Tergum 1 (Fig. 19). This contrasts with many other Gnorimoschemine genera which have the basal 1/3–1/2 darkly melanized and contrasting with unmelanized posterior section (Figs. 17–18). The unmelanized condition is widespread in Gelechiidae and Gelechioidea and may represent the plesiomorphic state, with the melanized state possibly representing an apomorphy of many Gnorimoschemini. In Lepidoptera phylogenetics, much attention has been given to the configuration of the abdominal base, especially the sternal sclerites, yet to our knowledge the features of the first tergite have rarely been considered. It is beyond the scope of this paper to assess its possible phylogenetic significance but we wish to bring attention to it here.




**FIGURES 29–32.** Male genitalia of *Agonochaetia* species. 29, *A. conspersa* ♂ (HT) (slide VNZ 78); 30, *A. incredibilis* ♂ (HT) (slide St. 321); 31, *A. intermedia* ♂ (slide GEL 90 P.H.); 32, *A. lvovskyi* ♂ (HT) (slide 163/15 O. Bidzilya)


**FIGURES 33–36.** Male genitalia of *Agonochaetia* species and *Canarischema fuerteventura*. 33, *A. shawinigan* ♂ (HT) (slide MIC 4240); 34, *A. terrestrella* ♂ (slide 14978 NHMW); 35, *A. tuvella* ♂ (slide 66/03 O. Bidzilya); 36, *Canarischema fuerteventura* ♂ (HT) (slide 6319 H. Hendriksen).

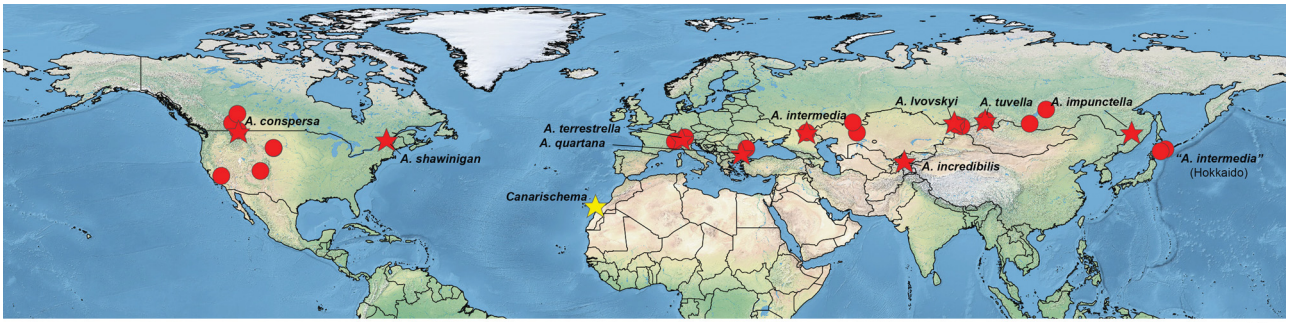



**FIGURES 37–39.** Female genitalia of *Agonochaetia* species. 37, *A. impunctella* ♀ (HT) (slide 176452/4220, K.T. Park 1996); 38, *A. intermedia* ♀ (slide GU 87/107, P. Huemer); 39, *A. quartana* ♀ (HT) (slide 3222 Povolný),

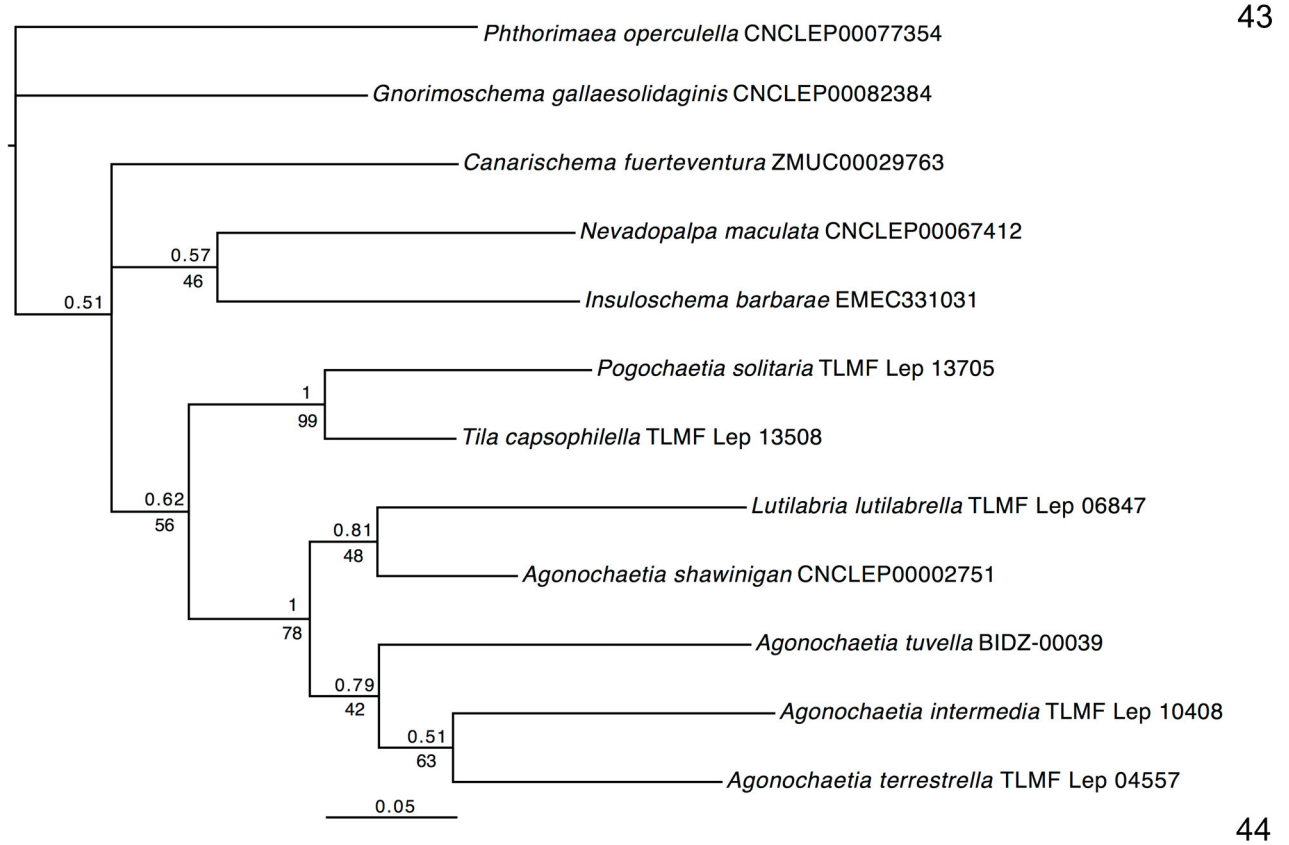
**Phylogenetic considerations.** A persistent problem is that the definition and monophyly of Gnorimoschemini remain elusive. The defining characters of the tribe remain vague since it was originally characterized based on transformational trends in genital morphology, with no unique characters or synapomorphies given (Povolný 1964; Huemer & Karsholt 2010). A combination of characters has been cited that weakly supports the monophyly of Gnorimoschemini, namely the hook-like signum and a ventromedial zone of microtrichia in the area around the ostium bursae in the female genitalia (Huemer & Karsholt 1999; Ponomarenko 2009). However, one or both of these traits are absent in several genera. Moreover, an acrinoid signum, that is hook-like with a base plate, may be a groundplan condition within the Gelechioidea if one considers that it occurs with various degrees of development in several seemingly unrelated families such as Oecophoridae, Coleophoridae, Momphidae, Depressariidae (Ethmiinae), and Cosmopterigidae (Chrysopeleiinae). The reduction of muscle m7 in male genitalia may be

another unifying trait (Kuznetsov & Stekolnikov 2001) but it has been ascertained for very few gelechiids so inferences based on this reduction are highly tentative. Neither Kaila (2004) nor Heikkilä *et al.* (2013) included any representatives from Gnorimoschemini in their cladistic treatments of Gelechioidea. A recent multi-gene phylogeny of Gelechiidae (Karsholt *et al.* 2013) found the Gnorimoschemini subordinate to the Gelechiini, however, taxon sampling was limited and did not include glandiductor-bearing gnorimoschemines.


**FIGURES 40–42.** Female genitalia of *Agonochaetia* species and *Canarischema fuertevenura*. 40–41, *A. terrestrella* ♀♀ (slides 16367 BMNH, GU 06/1254 P.H. BNMC); 42, *Canarischema fuerteventura* ♀ (PT) (slide 138/15 O. Bidzilya).




43




44

**FIGURES 43-44.** 43, Map of type localities (red stars) and distribution (red dots) of *Agonochaetia* and *Canarischema* (yellow star). 44, Bayesian inference of relationships between selected Gnorimoschemini genera based on COI barcode data. Values above nodes are posterior probabilities; those below nodes are bootstrap values from the Parsimony analysis (values from the Maximum Likelihood analysis were very similar).

It is intriguing that in a phenetic analysis of gnorimoschemine genera Povolný & Šustek (1988) found that *Agonochaetia* grouped next to *Lutilabria* in a cluster that also included *Keiferia, Tildenia, Klimeschiopsis* and *Tila.* Among the latter four genera, *Tila* alone has glandiductors. Their analysis was conducted with the premise that the tribe Gnorimoschemini formed a natural group and no 'outgroup' was included. Besides the fact that this kind of morphology-based phenetic analysis to elucidate relationships has largely fallen out of favor in systematics, Povolný & Šustek's (1988) work is very difficult to assess because the coding and mapping of character states appear unorthodox (typological, e.g. defined as 'taxon-name-oid') and excessively fragmented (some characters have more than 15 states), not to mention that the character matrix is printed in tiny, almost unreadable typeset.

The cytochrome oxidase I (COI) gene, which includes the barcode region, while generally very useful at the species level discrimination among taxa, may have more limited value when it comes to assessing deeper relationships. This is due to the high variability of this part of the genome and the tendency for the saturation effect to obscure higher relationships. It is also sensitive to sparse taxon sampling whereby relatively distant taxa may skew the results in showing spurious similarities.

The position of *Lutilabria* sharing a node with *A. shawinigan* within *Agonochaetia* in our COI tree, with

moderate support, would suggest that the latter is paraphyletic. However, it must be noted that support is as moderate or weaker among the other species of *Agonochaetia* and the other glandiductor-bearing genera as well, suggesting that the results may reflect more the limitations of the available dataset than possible relationships.

Morphologically, *Lutilabria* shares some overall similarity in aspect of the male genitalia to *Agonochaetia* as well as in having broad wings. However, it lacks glandiductors and has a mesio-distal process of the gnathos. Striking as they seem, glandiductors are poorly understood and perhaps are more phylogenetically 'labile' than their apparent structural complexity suggest. These discordances underline the need for a more extensive and detailed morphological analysis as well as wider gene sampling, which were beyond the scope of this work. Because of this, we refrain from making generic changes in the confines of this limited study. Nevertheless we feel that it is valuable to show these results, however preliminary, as a reflection of the current state of knowledge of the group.

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